



DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207-3199

REPLY TO:
ATTENTION OF:

PERMITTEE: CITY OF CLEVELAND

PERMIT NUMBER: 98-494-0112(1)

EFFECTIVE DATE: MAY 18, 2001

NOTE: The term you and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below. (and continue on page 5)

PROJECT DESCRIPTION: THE CITY OF CLEVELAND, DEPARTMENT OF PORT CONTROL, 5300 RIVERSIDE DRIVE, CLEVELAND, OHIO 44135-3193, IS HEREBY AUTHORIZED BY THE SECRETARY OF THE ARMY TO: FILL 87.85 ACRES OF WETLANDS, 5400 LINEAR FEET OF ABRAM CREEK, AND 2500 LINEAR FEET OF UNNAMED TRIBUTARIES TO ABRAM CREEK, IN ORDER TO CONSTRUCT IMPROVEMENTS TO CLEVELAND HOPKINS INTERNATIONAL AIRPORT ("CLE") IN ACCORDANCE WITH THE GENERAL AND SPECIAL CONDITIONS, AND THE PLANS AND DRAWINGS AND ANY ADDITIONAL SPECIAL CONDITIONS ATTACHED HERETO WHICH ARE INCORPORATED IN AND MADE A PART OF THIS PERMIT.

PROJECT LOCATION: THE PROJECT IS LOCATED IN ABRAM CREEK, ADJACENT WETLANDS AND UNNAMED TRIBUTARIES, AT GRAYTON ROAD, IN THE CITY OF CLEVELAND, CUYAHOGA COUNTY, OHIO.

PERMIT CONDITIONS

GENERAL CONDITIONS:

1. The time limit for completing the work authorized ends on May 18, 2006. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.
2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you must make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity, or should you desire to abandon it without a good faith transfer, you may obtain a modification of this permit from this office, which may require restoration of the area.
3. If you discover any previously unknown historic or archaeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.
4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.
5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit.
6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

FURTHER INFORMATION:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:
Section 404 of the Clean Water Act (33 U.S.C. 1344).
2. Limits of this authorization.
 - a. This permit does not obviate the need to obtain other Federal, state or local authorizations required by law.
 - b. This permit does not grant any property rights or exclusive privileges.
 - c. This permit does not authorize any injury to the property or rights of others.
 - d. This permit does not authorize interference with any existing or proposed Federal project.
3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as this specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

REP. 821
(PERMITTEE)

5/18/01
(DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Glen R. DeWillie
Glen R. DeWillie, Lieutenant Colonel, U.S. Army
(DISTRICT COMMANDER)

May 18, 2001
(DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFeree)

(DATE)

SPECIAL CONDITIONS:

1. That you are responsible for ensuring that the contractor and/or workers executing the activity(s) authorized by this permit have knowledge of the terms and conditions of the authorization and that a copy of the permit document is at the project site throughout the period the work is underway.
2. That this permit does not authorize the discharge of dredged or fill material into Abram Creek, upstream or downstream of the authorized fill, for the purpose of creating temporary structures that include but are not limited to groins, cofferdams, work pads, laydown areas, and access roads.
3. Disturbance to the beds and banks of the streams, lakes and wetlands shall be kept to the minimum necessary to complete the project.
4. That the fill created by the discharge shall be properly maintained to prevent erosion and other non-point sources of pollution.
5. Turbidity controls in the form of silt curtains or similar type cloth material shall be installed in Abram Creek, bank-to-bank, a maximum of 25 feet downstream from the lower limits of the project area and shall remain in place during all excavation and restoration operations.
6. That prior to the discharge of any dredged or fill material into waters of the United States as authorized by this permit, you shall install and maintain erosion and sedimentation controls in and/or adjacent to wetlands or other waters of the United States which are not immediately scheduled to be filled and/or authorized to be filled. Plans for erosion and sedimentation controls in and/or adjacent to wetlands or other waters of the United States shall be contained in a project specific Storm Water Pollution Prevention Plan (SWP3) that has been approved by the Ohio Environmental Protection Agency. The SWP3 and request for approval of the erosion and sedimentation controls in and/or adjacent to wetlands or other waters of the United States shall be submitted to Mr. Dan Bogoevski of the Ohio Environmental Protection Agency, Northeast District Office, 2110 E. Aurora Road, Twinsburg, Ohio 44087. Mr. Bogoevski can also be reached by calling 330-963-1145. A copy of the approved SWP3 shall be submitted to this office ATTN: Mr. Alan R. Anacheka-Nasemann.
7. That the permittee shall periodically inspect the Abram Creek culverts and shall maintain the culverts to ensure that they are not clogged and impeding water circulation and flow.
8. That the wetland mitigation report, titled: Preliminary Wetland Mitigation Plan for The Cleveland Hopkins International Airport Expansion Located in Cuyahoga County, Ohio ("Wetland Restoration Plan", prepared by Envirotech Consultants, Inc., dated January 26,

SPECIAL CONDITIONS CONTINUED:

2000 and last revised June 14, 2000 is hereby incorporated in and made a part of this Department of the Army Permit, subject to the stipulations identified in Special Condition Nos. 9-14, 30 and 31, below.

9. That as partial mitigation for the filling of 87.85 acres of wetlands you have agreed to restore 265 acres of wetlands, and preserve the created wetlands within properties owned and operated by Lorain County Metroparks, as shown on the attached drawings.

10. That construction of the LaGrange Township wetland mitigation project shall commence no later than October 31, 2001, and shall be completed within one year of commencement.

11. That construction of the Columbia Station wetland mitigation project shall commence no later than October 31, 2002 and shall be completed within one year of commencement.

12. That the following species shall be excluded from all project planting and landscaping within 100 feet of the wetland mitigation areas:

-Herbs:

Glyceria maxima
Lythrum salicaria
Phalaris arundinacea
Phragmites spp.
Polygonum cuspidatum
Typha latifolia, T. angustifolia, T. x glauca
Echinochloa crusgalli

-Woody Plants:

Eleagnus angustifolia
Lonicera tatarica, L. morrowii, L. xylosteum
Populus alba
Rhamnus cathartica, R. frangula
Rosa multiflora
Solanum dulcamera

13. That you shall monitor the success of the wetland mitigation areas twice annually (April 15 - May 15 and September 1 - September 30), so as to characterize the dominant vegetation in the constructed wetland areas at different times, and under different hydrological conditions, during the growing season.

SPECIAL CONDITIONS CONTINUED:

14. That corrective measures shall be implemented to preclude the growth of the following invasive plant species should they appear within the wetland mitigation areas: *Phalaris arundinacea*, *Phragmites australis*, *Solanum dulcamera*, *Rhamnus spp.*, *Rosa multiflora*, *Polygonum cuspidatum*, *Lythrum salicaria*, *Typha angustifolia* and *Typha x glauca*.

15. That the stream mitigation report titled, Preliminary Stream Restoration Plan for West Fork, East Branch of the Black River, Medina County, Ohio ("West Fork Restoration Plan"), prepared by Envirotech Consultants, Inc., dated January 5, 2001 and revised January 24, 2001 is hereby incorporated and made a part of this Department of the Army Permit, subject to the stipulations identified in Special Condition Nos. 16-18 and 30, below.

16. That as partial mitigation for the filling of 7900 linear feet of streams you shall restore a minimum of 5000 linear feet of the West Fork.

17. That construction of the West Fork Restoration Plan project shall commence no later than June 30, 2002, and shall be completed within one year of commencement.

18. That you shall monitor the success of the West Fork Restoration Plan in accordance with protocols outlined in the plan, and shall submit a schedule for annual monitoring activities within 120 days of the date of this permit. Monitoring activities must be sufficient to document compliance with the performance goals specified in the Plan.

19. That the stream mitigation report titled, Conceptual Restoration Plan for Doan Brook, City of Cleveland, Ohio ("Doan Brook Enhancement Plan"), prepared by Malcolm Pirnie, Inc., and dated May, 2000 is hereby incorporated and made a part of this Department of the Army Permit, subject to the stipulations identified in Special Condition Nos. 20-22 and 30, below.

20. That as partial mitigation for the filling of 7900 linear feet of streams, you shall enhance a minimum of 12,400 linear feet of Doan Brook, including 9,213 linear feet of in-stream physical habitat modifications and 12,400 linear feet of hydraulic modifications.

21. That prior to implementation of the Doan Brook Enhancement Plan you shall initiate consultation pursuant to Section 106 of the National Historic Preservation Act, in accordance with Part VI of the October 19, 2000 Memorandum of Agreement Among the Federal Aviation Administration, The National Aeronautics and Space Administration, The Ohio State Historic Preservation Officer and the Advisory Council on Historic Preservation Regarding Proposed Development at Cleveland Hopkins International Airport, Cuyahoga County, Ohio. A copy of written notification of said consultation shall be forwarded to this office, ATTN: Alan Anacheke-Nasemann. The District Commander reserves the right to modify this permit should the Section 106 consultation result in a determination that the Doan Brook Enhancement Plan would cause an adverse effect to a property listed or potentially eligible

SPECIAL CONDITIONS CONTINUED:

for listing in the National Register of Historic Places, or otherwise preclude the successful completion of all or part of the Doan Brook Enhancement Plan. Modification may include, but is not limited to, additional mitigation to offset the aquatic resource impacts of the authorized fill.

22. That construction of the Doan Brook Enhancement Plan shall commence within one year of completion of Section 106 consultation pursuant to Special Condition No. 20, unless precluded by the results thereof, and shall be completed within two years of commencement.

23. That as partial mitigation for the filling of 7900 linear feet of streams, you have agreed to provide \$682,000.00 to the Chagrin River Land Conservancy, which has agreed to dedicate these funds to restore 3,264 linear feet of Woodiebrook Creek, at Woodiebrook Road, Munson Township, Geauga County, Ohio.

24. That you shall monitor the success of the Woodiebrook Creek Restoration Plan in accordance with protocols approved by the Chagrin River Land Conservancy and shall submit a copy of an approved monitoring plan within 120 days of the date of this permit. Monitoring results shall be reported as specified in Special Condition No. 30, below.

25. That you shall provide verification of the transfer of all designated and/or required funds to the Chagrin River Land Conservancy, in accordance with Special Condition No. 23, no later than 120 days after the effective date of this permit.

26. That as partial mitigation for the permanent loss of 87.85 acres of wetlands, and 7900 linear feet of streams, you have agreed to provide up to \$2,000,000.00 to Cleveland Metroparks, which has agreed to dedicate these funds to preserve 3600 linear feet of Abram Creek, 40.9 acres of adjacent wetlands and 45 acres of upland buffer at an 85.9 acre site located on Abram Creek, south of Bagley Road, City of Middleburg Heights, Cuyahoga County, Ohio.

27. That you shall provide verification of an agreement with Cleveland Metroparks, including a projected expenditure schedule, in accordance with Special Condition No. 26, no later than 120 days after the effective date of this permit.

28. That as partial mitigation for the permanent loss of 7900 linear feet of streams you shall preserve 1070 linear feet of Abram Creek and associated upland buffer within a Conservation Area located on City of Cleveland property immediately downstream of the authorized culvert and fill on Abram Creek, through a conservation easement. The conservation easement shall be subject to the following conditions:

a. The conservation easement shall contain language that specifies the acreage of the Conservation Area, and protects and preserves the Conservation Area as perpetual,

SPECIAL CONDITIONS CONTINUED:

undeveloped stream corridor and green space. The easement shall specifically state that neither Abram Creek nor any upland buffer areas within the easement may be encroached upon by residential or other buildings, roadways, bridges or other structures, and that the removal of live vegetation is specifically prohibited.

b. The permittee shall designate a third party to hold and enforce the conservation easement, subject to written approval from the U.S. Army Corps of Engineers.

c. A draft copy of the Conservation Easement must be submitted to this office within 120 days of approval of this permit. A signed and notarized copy of the Conservation Easement shall be forwarded to the Corps of Engineers within 30 days of written approval by the Corps.

29. That as partial mitigation for the permanent loss of 7900 linear feet of streams, you have agreed to provide \$500,000.00 to Lorain County Metroparks, which has agreed to dedicate these funds to preserve 3000 linear feet of Elk Creek, LaGrange and Carlisle Townships, Lorain County Ohio. This office has received verification of the transfer of these funds and acknowledges your full compliance with this Special Condition.

30. That as partial mitigation for the permanent loss of 7900 linear feet of streams, you have agreed to provide \$600,000.00 to the Geauga County Park District, which has agreed to dedicate these funds to preserve 4707 linear feet of Spring Brook, Munson Township, Geauga County Ohio. This office has received verification of the transfer of these funds and acknowledges your full compliance with this Special Condition.

31. That Monitoring Reports for each of the wetland and stream restoration and/or enhancement projects shall be forwarded to the Buffalo District, U.S. Army Corps of Engineers according to the following protocol:

a. Baseline Report: Due on December 31 in the year of completion of all mitigation construction activities. The Baseline report must include an "as-built" topographic and hydrographic survey of the restored/enhanced wetland and stream areas. (Note: for purposes of this special condition, "completion" means all activities associated with site preparation, removal of any existing structures, fills and/or vegetation, excavation, grading, and establishment of final contours).

b. Mid-term Report: Due on December 31 in the year of the second anniversary of completion of all mitigation construction activities. The Mid-term Report must describe any potential problems with achieving the performance criteria described below, and any and all corrective actions taken. Corrective actions may include, but are not limited to: re-grading to achieve necessary hydrology, planting of hydrophytic vegetation, and control of invasive plant species.

SPECIAL CONDITIONS CONTINUED:

c. Final Report: Due on December 31 in the year of the fifth anniversary of completion of all mitigation construction activities. The Final Report must include a discussion of whether the performance criteria were achieved, and any further recommendations for remedial measures, if necessary.

d. In order to ensure timely monitoring of each of the stream and wetland mitigation sites the permittee shall provide a Reporting Schedule specifying due dates of the Baseline, Midpoint, and Final Mitigation reports for each restoration or enhancement site.

32. That at the end of the fifth year post construction of each wetland restoration area, the restored wetlands shall be vegetated with a minimum of 80% areal cover of hydrophytic vegetation, excluding *Myriophyllum spicatum*. In addition, less than 5% areal cover of the mitigation area shall be vegetated with the following invasive species: *Lythrum salicaria*, *Phragmites spp.*, *Phalaris arundinacea*, *Solanum dulcamera*, *Rhamnus frangula*, *Typha angustifolia*, and *Typha x glauca*. In the event that these criteria are not met, the applicant shall undertake remedial actions identified by the District Commander. These actions may include, but are not limited to, corrective actions described above, or an alternative wetland mitigation plan to be implemented on the same or an alternate site.

33. There shall be no construction or placing of buildings, camping accommodations or mobile homes, fences, signs, billboards or other advertising material, or other structures within the limits of the designated mitigation areas without first obtaining Department of the Army authorization.

34. The permittee shall take all appropriate and reasonable measures to ensure that there shall be no filling, excavating, dredging, mining or drilling, removal of topsoil, sand, gravel, rock, minerals, or other materials, nor any building of roads or change in the topography of the land in any manner excepting the maintenance of foot trails within the mitigation areas without first obtaining Department of the Army authorization.

35. The permittee shall take all appropriate and reasonable measures to ensure that there shall be no removal, destruction, or cutting of vegetation, spraying with herbicides, grazing of domestic animals, or disturbance or manipulation of the mitigation area without first obtaining Department of the Army authorization. Control of nuisance vegetation, or any other manipulation within the mitigation areas, shall only occur after receiving Corps of Engineers concurrence that such management practices are necessary to ensure the long-term success of the mitigation program.

36. That prior to commencing the authorized work you must notify the District Commander of the dates you intend to commence the project. You must also provide notification of the date of completion.

SPECIAL CONDITIONS CONTINUED:

37. That at the request of an authorized representative of the Buffalo District, U.S. Army Corps of Engineers, you shall ensure access to the project site and the mitigation parcels to determine compliance with the conditions of this permit.

38. The permittee shall assume all responsibility for complying with all Special Conditions. If the mitigation construction activities and/or the reports required under these conditions are not commenced or submitted by the specified dates, unless a time extension is approved in writing by the Corps of Engineers, the permittee shall pay stipulated penalties in the amount of \$100.00 per day for each day past the submittal date. Such funds shall be submitted by check made payable to "The Finance and Accounting Officer," and forwarded directly to the Office of Counsel, U.S. Army Corps of Engineers, Buffalo District, 1776 Niagara Street, Buffalo, New York 14207-3199.

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Lake Erie

APPROX. MEAN ELEV. 572

Restoration Sites:

- Doan Brook Stream Restoration Site
- Spring Brook Stream Preservation Site & Woodiebrook Creek Stream Restoration Site
- Elk Creek Stream Preservation Site
- West Fork Stream Restoration Site
- LCMP - Columbia Station Wetland Restoration Site
- LCMP - LaGrange Wetland Restoration Site
- Abram Creek Headwaters Wetlands Preservation Site
- Cleveland Hopkins International Airport Abram Creek and Wetland Impact Sites & Abram Creek Preservation Site

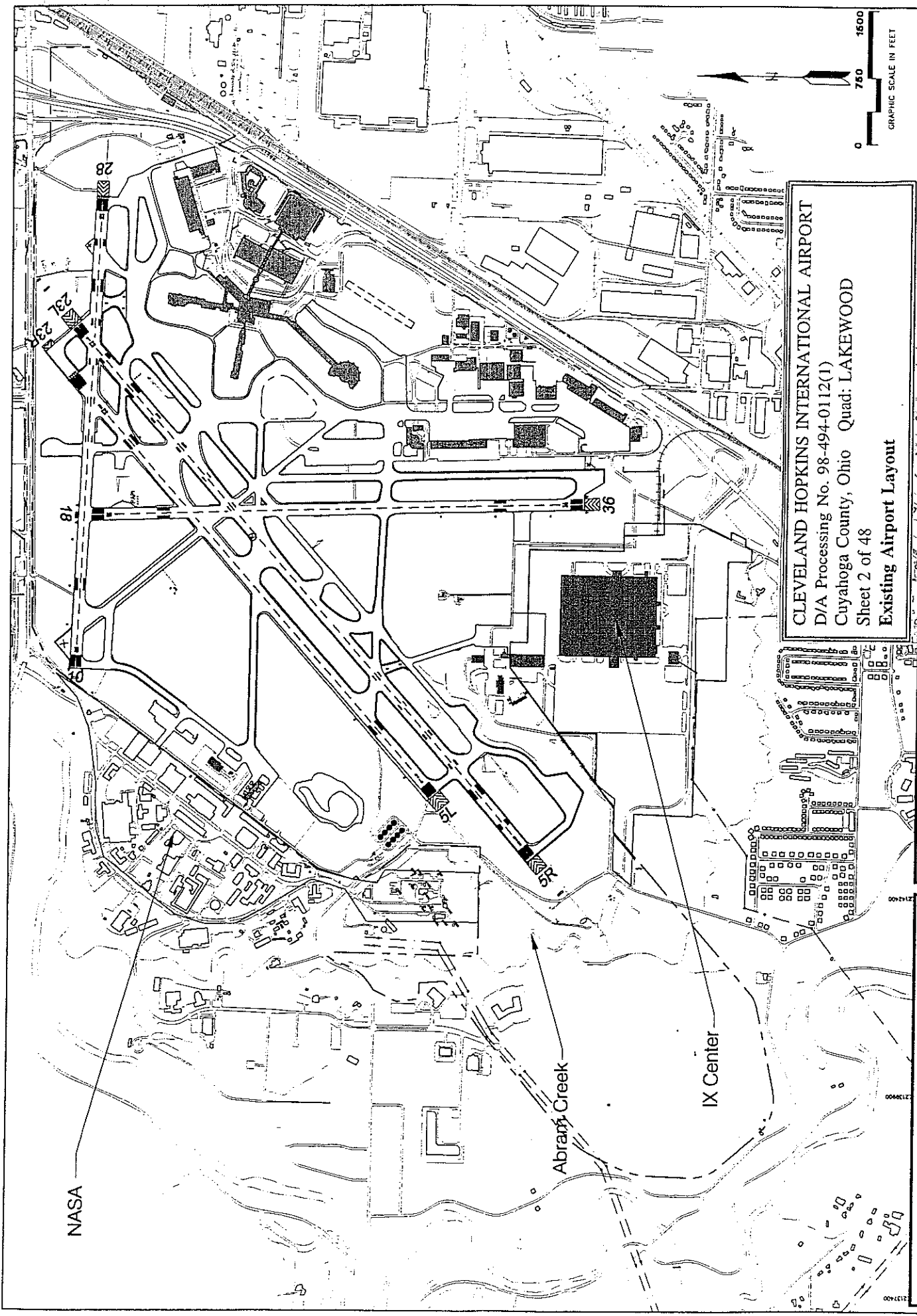
Watersheds:

- USGS Watershed Unit # 04110003 Chagrin R. & Nearby Basins
- USGS Watershed Unit # 04110002 Cuyahoga River Basin
- USGS Watershed Unit # 04110001NA Black/Rocky River Basins

Other Labels:

- Willoughby
- Cleveland
- Lorain
- Vermilion
- Garrettsville
- Wadsworth
- Seville
- Creston
- Polk
- Savannah
- New London
- West Fort
- Chippewa Lake
- Wadsworth
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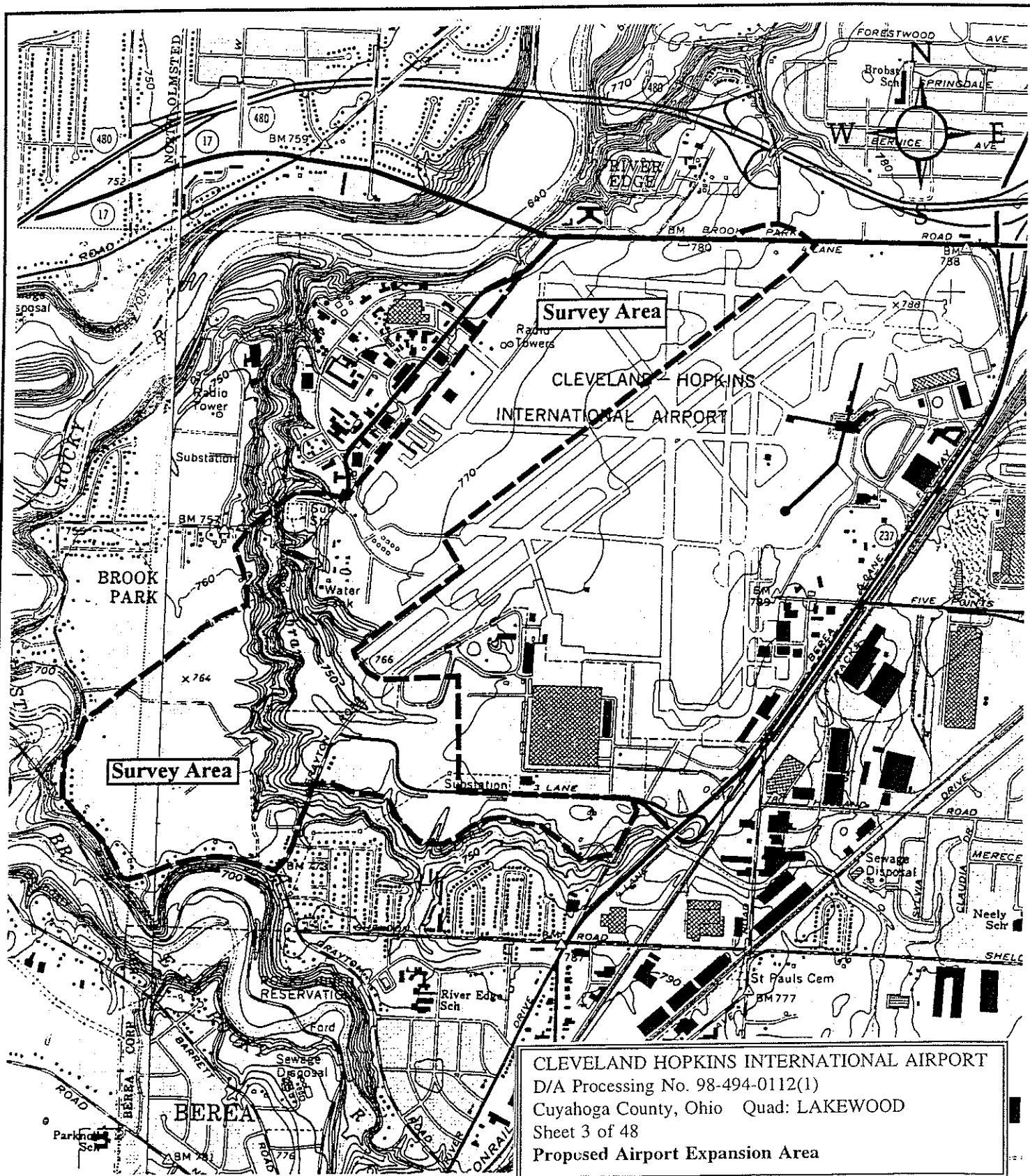
CLEVELAND HOPKINS INTERNATIONAL AIRPORT
D/A Processing No. 98-494-0112(1)
Cuyahoga County, Ohio Quad: LAKEWOOD
Sheet 2 of 48
Existing Airport Layout



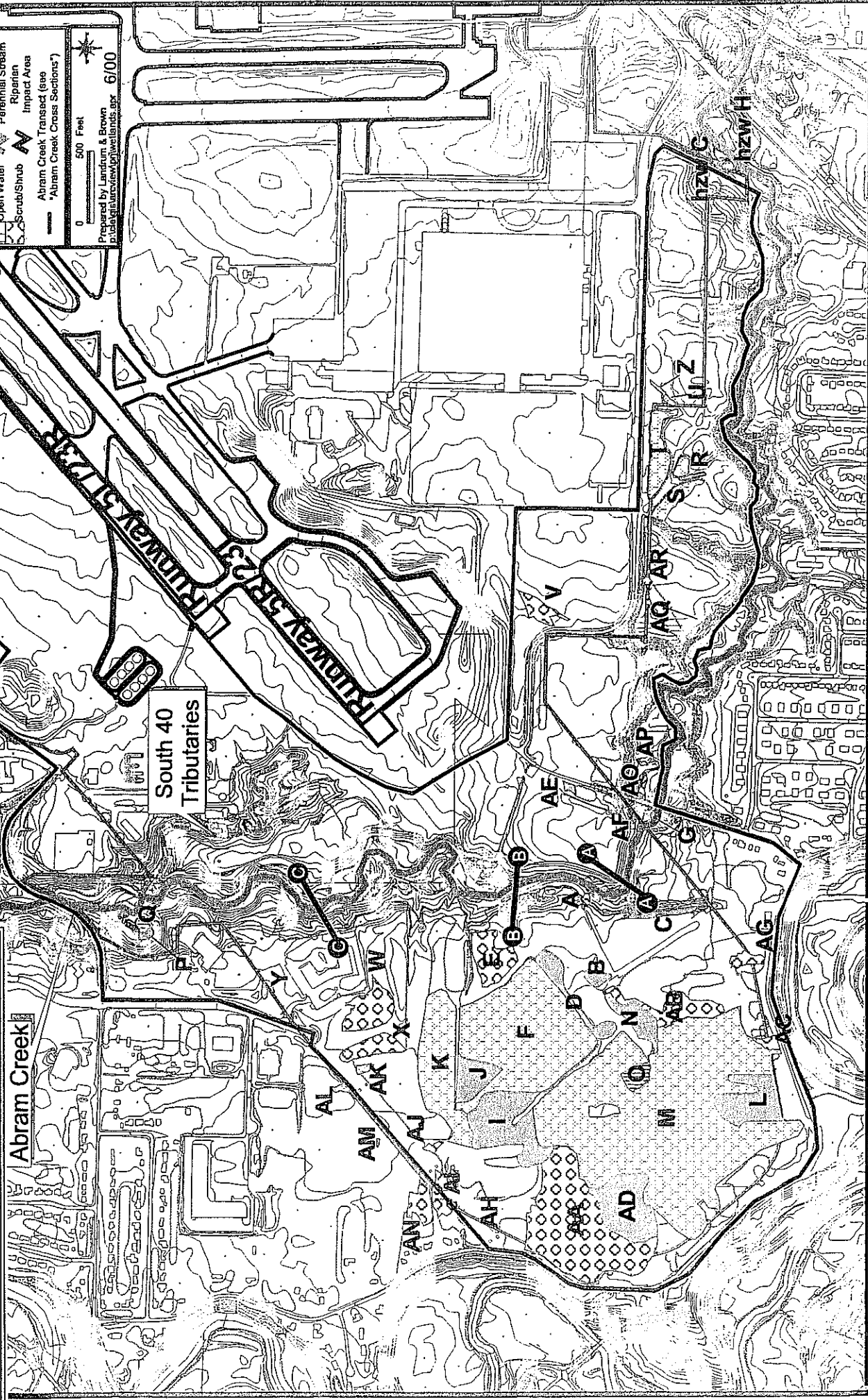
Exhibit
1-2

Existing Airport Layout

Cleveland Hopkins International Airport
Environmental Impact Statement



CLEVELAND HOPKINS INTERNATIONAL AIRPORT
 D/A Processing No. 98-494-0112(1)
 Cuyahoga County, Ohio Quad: LAKEWOOD
 Sheet 4 of 48
Existing Wetlands and Streams



Cleveland Hopkins International Airport

Wetland and Stream Features

Exhibit: 4-1

Table 4-2 Wetlands in the Cleveland Hopkins International Airport Study Area.
Cleveland Hopkins International Airport

ID #	CLASS	DESCRIPTION AND DOMINANT SPECIES	OEPA CAT.	Total Acres	Acres within CLE Property	Affected Acreage
A	PSSIY	Depressional, shrub wetland overlooking Abram Creek with pin oak, ironwood, dogwood, sycamore, soft-rush, deer-tongue and peppermint.	1	0.08	0.08	0.08
B ¹	PEMIY	Depressional, emergent wetland southeast of light lane and access road with wool-grass, path rush, soft rush, deer-tongue, swamp milkweed, false pimpernel and peppermint.	3	0.52	0.52	0.52
C	PEMIY	Drainage wetland from access road to Abram Creek dominated by reed grass with horsetail, black willow, green ash and cottonwood.	1	0.37	0.37	0.37
D ¹	PEMIY	Diked, emergent wetland isolated by ditch and access road with wool-grass, path rush, soft rush, American elm, sensitive fern, swamp milkweed, dogwood and Japanese honeysuckle.	3	1.56	1.56	1.56
E ¹	PSSIY	Depressional, scrub-shrub wetland isolated by ditches and access road with meadowsweet, dogwood, arrowwood, pin oak, wool-grass, grass-leaf goldenrod, swamp milkweed, and soft rush.	3	2.07	2.07	2.07
F ¹	PFOIY	Flooded forest wetland with silver maple, pin oak, green ash, dogwood, American elm.	3	14.99	14.99	14.99
G	PEMIY	Depressional, emergent wetland in Abram Creek flood plain 500' west of Grayton Road with American elm, ironwood, dogwood, blue flag, moneywort, arrowhead, touch-me-not and fowl manna grass.	1-2	0.06	0	0
H	man-made	Drainage, hillside, emergent wetland from Grayton Road to Abram Creek dominated by reed grass.	NA	0	0	0
I ¹	PEMIY	Depressional, emergent wetland at end of Wood Block Road with wool-grass, sedges, sensitive fern, groovebur, swamp milkweed, blue vervain, soft rush, and arrowwood.	3	4.86	4.86	4.86
J ¹	PEMIY	Depressional, emergent wetland between Old Five Points Road and Wetland F with wool-grass, fringed sedge, sensitive fern, soft rush and arrowhead.	3	1.68	1.68	1.68
K	PFOIY	Forested wetland with silver maple, pin oak, green ash, dogwood, American elm.	3	5.96	5.96	5.96
L ¹	PEMIY	Abandoned agricultural field with Canada goldenrod, soft rush, grass-leaf goldenrod	3	3.02	3.02	2.71

¹ part of the large contiguous wetland communities.Cleveland Hopkins International Airport
Department of Army Section 404 Permit Application
July, 2000CLEVELAND HOPKINS INTERNATIONAL AIRPORT
D/A Processing No. 98-494-0112(1)
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Wetland Characteristics

Table 4-2 Wetlands in the Cleveland Hopkins International Airport Study Area cont.
Cleveland Hopkins International Airport

ID #	CLASS	DESCRIPTION AND DOMINANT SPECIES	OEPA CAT.	Total Acres	Acreage within CLE Property	Affected Acreage
M ¹	PFO1Y	Central forested wetland with silver maple, pin oak, green ash, dogwood, American elm.	3	38.02	37.38	33.69
N ¹	PEM1Y	Emergent wetland south of light lane with wool-grass, path rush, soft rush, prairie dogbane, deer-tongue, swamp milkweed, cattail, sensitive fern and horsetail (Noted as a pond on USDA Soil Map).	3	1.43	1.43	1.43
O ¹	POW	Submerged wetland west of light lane with wool-grass, soft rush, swamp knotweed, water hore-hound, swamp milkweed, cattail, sensitive fern and sedges (Noted as a pond on City GIS map).	3	0.62	0.62	0.62
P ²	PEM1Y	Depressional, emergent wetland between Pond Q and Abram Creek gorge with blue flag, shallow sedge, sensitive fern, dogwood and arrowhead.	2	0.15	0.15	0
Pond Q ²	POW	Small pond in Abram Creek flood plain at old home site with sunfish, bass and submerged plants.	NA	0.19	0.19	0
R ²	PFO1Y	Depressional, wooded wetland along proposed Aerospace Parkway with silver maple, green ash, box-elder, hawthorn dogwood, American elm, soft-rush, sedges and cattail.	2	0.29	0	0
S ²	PFO1Y	Wooded wetland along proposed Aerospace Parkway with silver maple, green ash, box-elder, dogwood, hawthorn, American elm, soft-rush, avens, sedges and cattail.	2	0.89	0	0
T ²	PFO1Y	Depression, wooded wetland along proposed Aerospace Parkway with silver maple, sycamore, dogwood, black willow, American elm, water plantain, soft-rush, sedges and cattail.	2	1.64	0	0
U ²	PFO1Y	Depression, wooded wetland along proposed Aerospace Parkway with silver maple, cottonwood, dogwood, black willow, American elm, soft-rush, sedges and cattail.	2	0.08	0	0
V ²	PSS1Y	Depression, shrub wetland north of I-X Center Road and west of I-X Center with dogwood, buckthorn, wool-grass, swamp milkweed, prairie dogbane and soft rush.	2	0.85	0	0
W	PSS1Y	Depression, shrub wetland SE of Aerospace Drive with dogwood, green ash, meadowsweet, purple loosestrife, cattail, reed, wool-grass, green bulrush, swamp milkweed and soft rush.	2	2.05	2.05	1.93

¹ part of the large contiguous wetland communities.² off-site wetland that will not be directly impacted by proposed airport expansion.

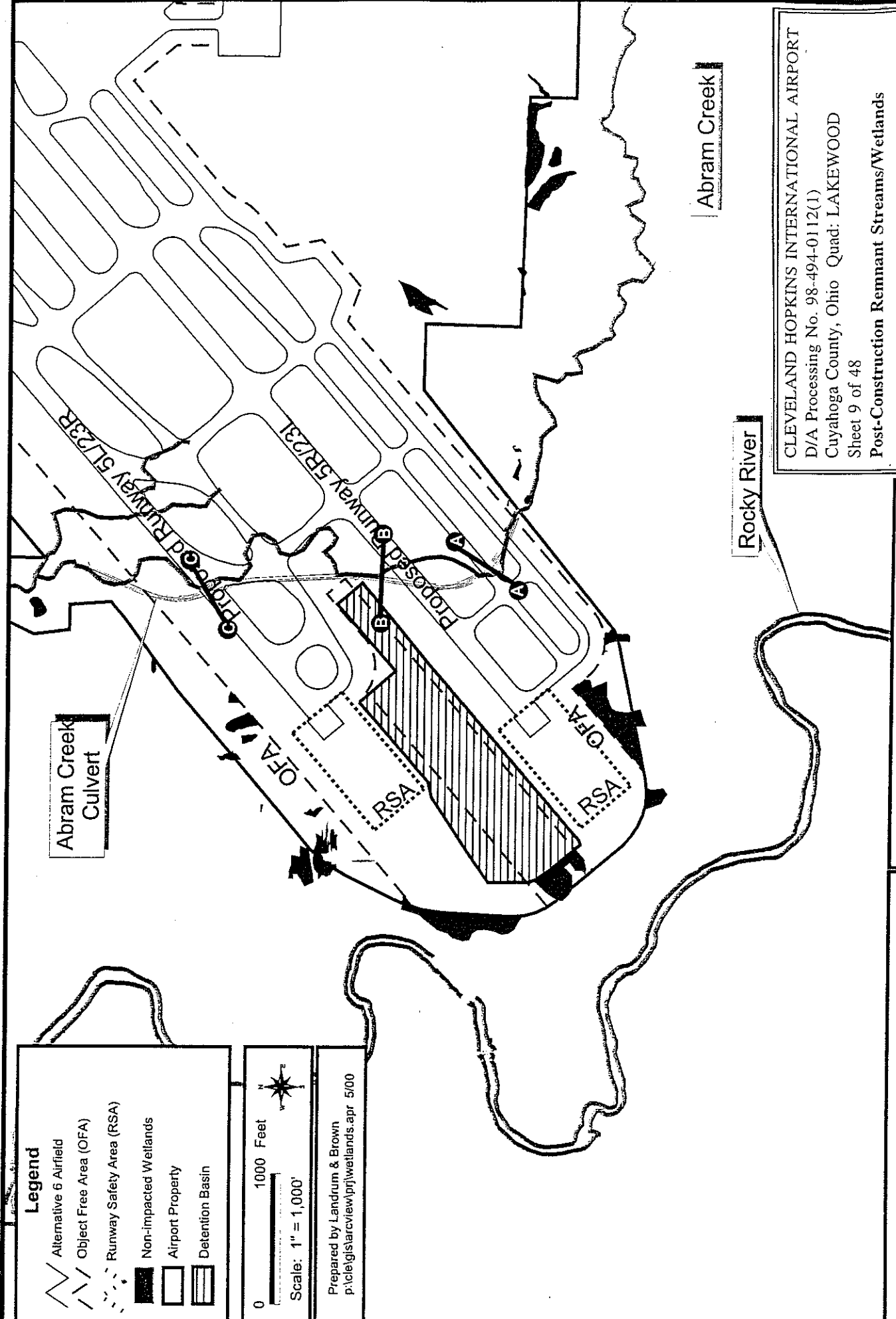
Table 4-2 Wetlands in the Cleveland Hopkins International Airport Study Area cont.
Cleveland Hopkins International Airport

ID #	CLASS	DESCRIPTION AND DOMINANT SPECIES	OEPA CAT.	Total Acres	Acres within CLE Property	Affected Acreage
X	PSS1Y	Depression, shrub wetland SE of Aerospace Drive with green ash, pin oak, arrowwood, box-elder, swamp milkweed, prairie dogbane, groovebur, yellow avens and soft rush.	2	1.24	1.24	0.71
Y	PEM1Y	Drainage, emergent wetland with common reed and cattail.	1	0.09	0	0
Z ²	PEM1Y	Depression, emergent wetland along proposed Aerospace Parkway and contiguous with Wetland U with sedges, soft rush, meadow foxtail and fowl manna grass.	2	0.08	0	0
AA ¹	PSS1Y	Edge wetland with silver maple, pin oak, dogwood, American elm, grass-leaf goldenrod.	3	11.27	8.57	8.52
AB ¹	PSS1Y	Edge shrub wetland with silver maple, pin oak, green ash, dogwood, American elm, grass-leaf goldenrod, glossy buckthorn.	3	2.10	2.10	1.89
AC ¹	PSS1Y	Edge shrub wetland with silver maple, pin oak, dogwood, American elm, grass-leaf goldenrod, and swamp rose.	3	0.33	0.16	0
AD ¹	PEM1Y	Abandoned agriculture field with Canada goldenrod, soft rush, grass-leaf goldenrod.	3	3.94	3.94	3.94
AE	PEM1Y	Blocked drain west side of Grayton Road with dogwood, cattail, reed grass, water-pepper and pin oak.	2	0.11	0.11	0.11
AF	PEM1Y	Slope seepage north side of Abram Creek with reed grass, bonaset and sensitive fern	2 ³	0.01	0.01	0
AG	PSS1Y	Isolated depression north of Ruple Parkway with wood reed grass, thistle, fowl meadow grass and jumpseed.	2 ³	0.47	0.32	0.1
AH	PEM1Y	Depression, emergent wetland northeast of Ruple Parkway with soft rush, bulrush, reed canary grass and dogwood.	1 ³	0.04	0.04	0.01
AI	PSS1Y	Depression, shrub wetland in electric power ROW with soft rush, elm, cottonwood, arrow-wood and fowl manna grass.	2	1.02	0.62	0
AJ	PSS1Y	Depression, shrub wetland in electric power ROW with sedges, soft rush, bulrush, elm, dogwood, pin oak and reed grass.	2 ³	0.14	0.14	0
AK	PFO1Y	Edge forest wetland with red maple, slippery elm, wood reed grass.	2 ³	0.15	0.15	0

Table 4-2 Wetlands in the Cleveland Hopkins International Airport Study Area cont.
Cleveland Hopkins International Airport

ID #	CLASS	DESCRIPTION AND DOMINANT SPECIES	OEPA CAT.	Total Acres	Acreage within CLE Property	Affected Acreage
AL	PFO1Y	Edge forest wetland with red maple and slippery elm.	2 ³	0.19	0.07	0
AM	PFO1Y	Forest wetland with sugar maple, red maple, pin oak, and swamp white oak	NA ³	0.02	0.00	0
AN	PSS1Y	Shrub wetland with slippery elm, stiff dogwood, glossy buckthorn, multiflora rose, northern arrow-wood.	NA ³	0.88	0.00	0
AO	PSS1Y	Shrub wetland with wood reedgrass, small water plantain, soft rush, common reed, water purslane, and wool grass.	NA ³	0.13	0.00	0
AP	PFO1Y	Forest wetland with wood reedgrass, slippery elm, and moneywort.	NA ³	0.04	0.00	0
AQ	PSS1Y	Shrub wetland with soft rush, silky dogwood, stiff dogwood, path rush, blunt mountain mint, and multiflora rose	NA ³	0.06	0.00	0
AR	PSS1Y	Shrub wetland with soft rush, silky dogwood, stiff dogwood, path rush and curled dock	NA ³	0.09	0.00	0
TOTAL WETLANDS AND OPEN WATERS						
				133.78	94.40	87.75
SUBTOTAL PALUSTRINE FOREST WETLANDS				62.27	58.55	54.64
SUBTOTAL PALUSTRINE SCRUB-SHRUB WETLANDS				22.82	17.39	15.31
SUBTOTAL PALUSTRINE EMERGENT WETLANDS				17.88	17.65	17.18
SUBTOTAL OPEN WATER and VERNAL POOL				0.81	0.81	0.62
WETLANDS NOT DIRECTLY AFFECTED BY PROJECT					9.38	16.03

¹ part of the large contiguous wetland communities.² off-site wetland that will not be directly impacted by proposed airport expansion.³ Ohio Wetland Assessments data was not available at the time of this report.

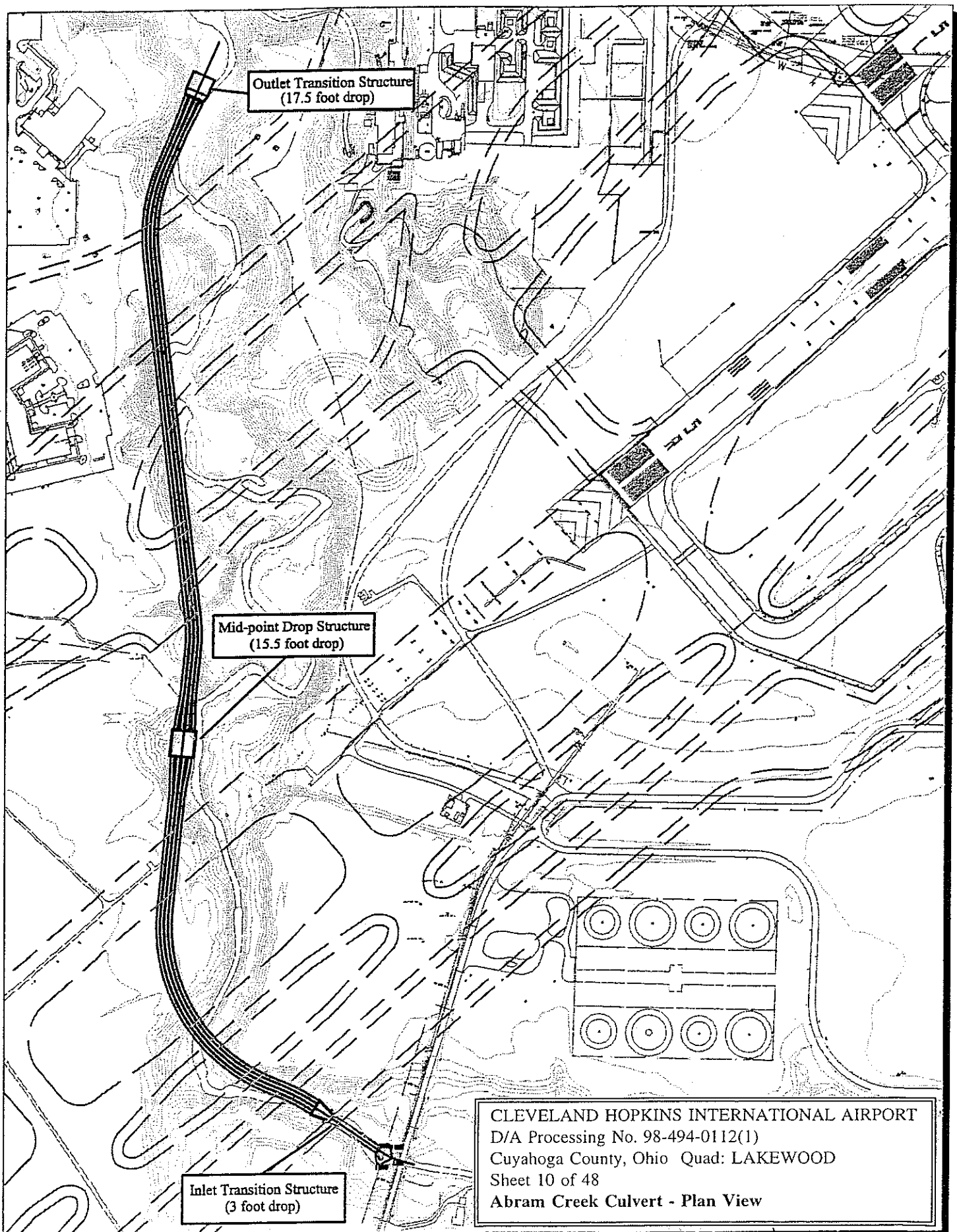


Cleveland Hopkins International Airport

Proposed Impacts

Exhibit 3-5

CLEVELAND HOPKINS INTERNATIONAL AIRPORT
D/A Processing No. 98-494-0112(1)
Cuyahoga County, Ohio Quad: LAKEWOOD
Sheet 9 of 48
Post-Construction Remnant Streams/Wetlands



Cleveland Hopkins International Airport

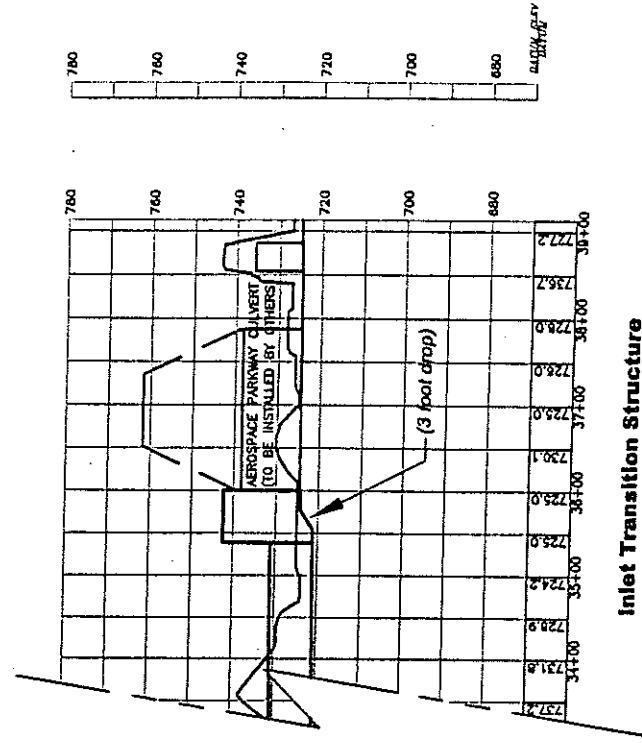
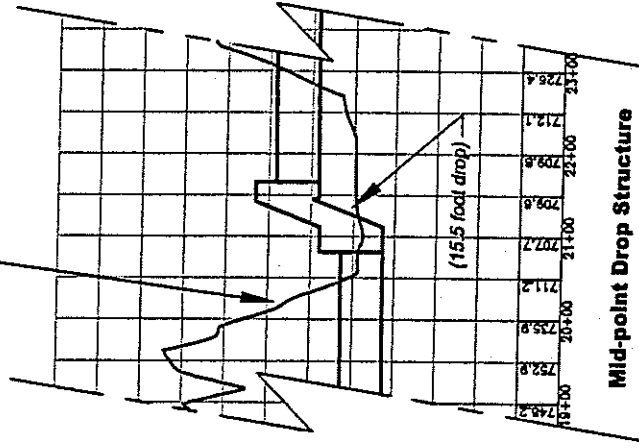
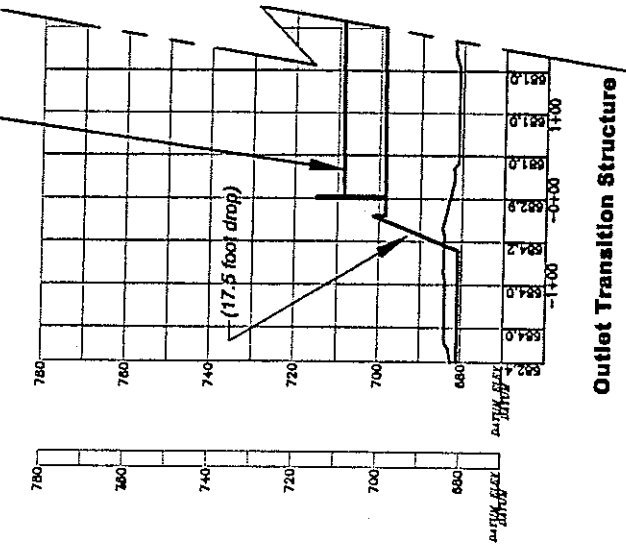
Proposed Culvert - Plan View

Exhibit:

C-1

Existing Ground Contour

Proposed Culvert

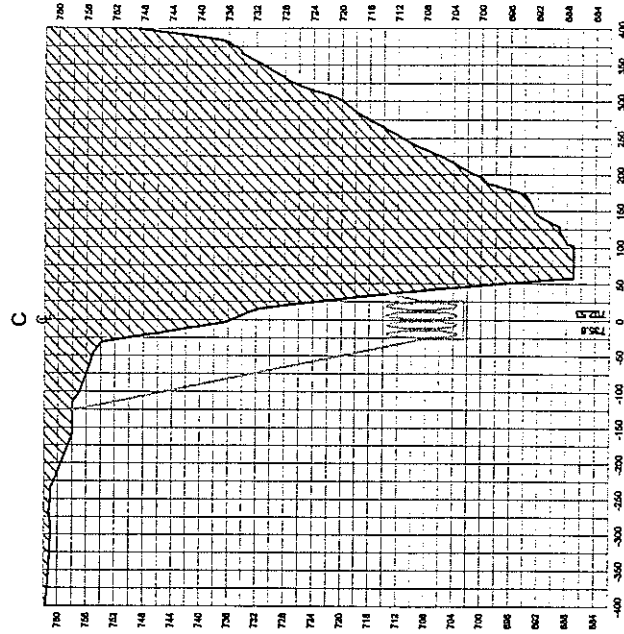
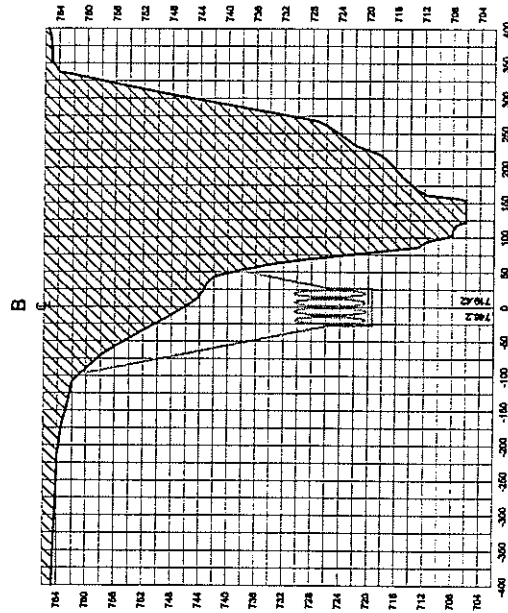
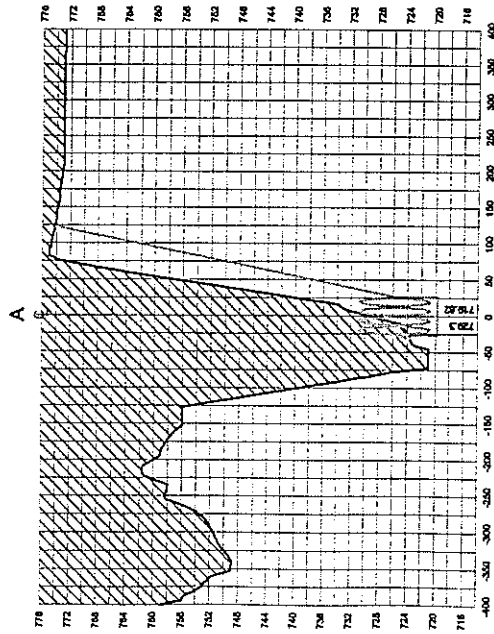





CLEVELAND HOPKINS INTERNATIONAL AIRPORT
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Cuyahoga County, Ohio Quad: LAKEWOOD
Sheet 11 of 48
Abram Creek Culvert - Profile View

Cleveland Hopkins International Airport

Proposed Culvert - Profile View

Exhibit:
C-2



-  Proposed Fill of Abram Creek
-  Existing Abram Creek
-  Culverted Abram Creek

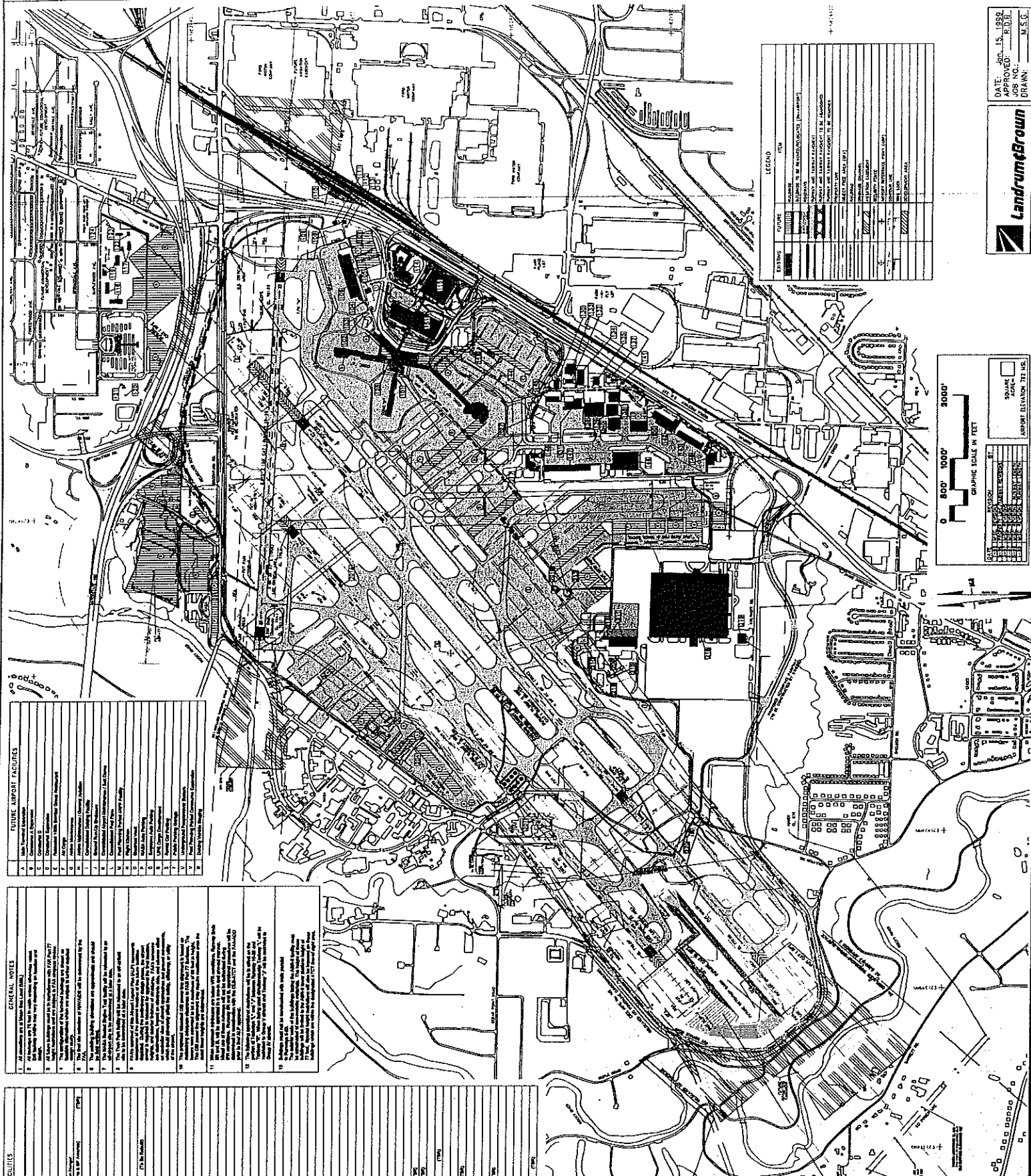
Note: Culvert Pipe is 10 feet in diameter

CLEVELAND HOPKINS INTERNATIONAL AIRPORT
D/A Processing No. 98-494-0112(1)
Cuyahoga County, Ohio Quad: LAKEWOOD
Sheet 12 of 48
Abram Creek Corridor Cross Sections

Cleveland Hopkins International Airport

Abram Creek Cross Sections

Exhibit:
3-6



NO.	DESCRIPTION	DATE
1	Runway Extension	
2	Runway Extension	
3	Runway Extension	
4	Runway Extension	
5	Runway Extension	
6	Runway Extension	
7	Runway Extension	
8	Runway Extension	
9	Runway Extension	
10	Runway Extension	
11	Runway Extension	
12	Runway Extension	
13	Runway Extension	
14	Runway Extension	
15	Runway Extension	
16	Runway Extension	
17	Runway Extension	
18	Runway Extension	
19	Runway Extension	
20	Runway Extension	

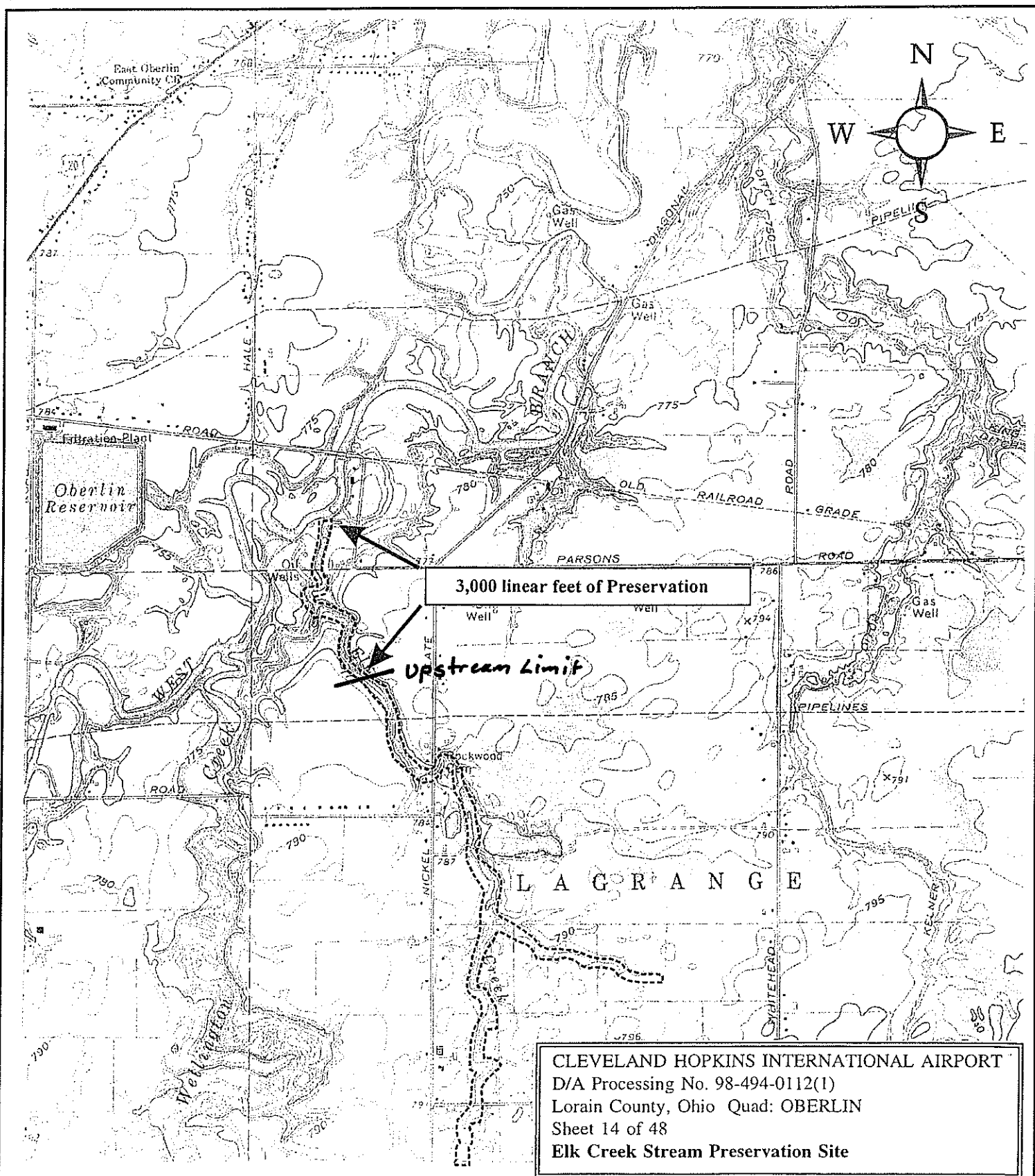
NO.	DESCRIPTION	DATE
1	All dimensions are in feet.	
2	All dimensions are to centerline unless otherwise noted.	
3	All dimensions are to be maintained at all times.	
4	All dimensions are to be maintained at all times.	
5	All dimensions are to be maintained at all times.	
6	All dimensions are to be maintained at all times.	
7	All dimensions are to be maintained at all times.	
8	All dimensions are to be maintained at all times.	
9	All dimensions are to be maintained at all times.	
10	All dimensions are to be maintained at all times.	
11	All dimensions are to be maintained at all times.	
12	All dimensions are to be maintained at all times.	
13	All dimensions are to be maintained at all times.	
14	All dimensions are to be maintained at all times.	
15	All dimensions are to be maintained at all times.	
16	All dimensions are to be maintained at all times.	
17	All dimensions are to be maintained at all times.	
18	All dimensions are to be maintained at all times.	
19	All dimensions are to be maintained at all times.	
20	All dimensions are to be maintained at all times.	

NO.	DESCRIPTION	DATE
1	Runway Extension	
2	Runway Extension	
3	Runway Extension	
4	Runway Extension	
5	Runway Extension	
6	Runway Extension	
7	Runway Extension	
8	Runway Extension	
9	Runway Extension	
10	Runway Extension	
11	Runway Extension	
12	Runway Extension	
13	Runway Extension	
14	Runway Extension	
15	Runway Extension	
16	Runway Extension	
17	Runway Extension	
18	Runway Extension	
19	Runway Extension	
20	Runway Extension	

CLEVELAND HOPKINS INTERNATIONAL AIRPORT
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 Cuyahoga County, Ohio Quad: LAKEWOOD
 Sheet 13 of 48
 Proposed Final Airport Layout

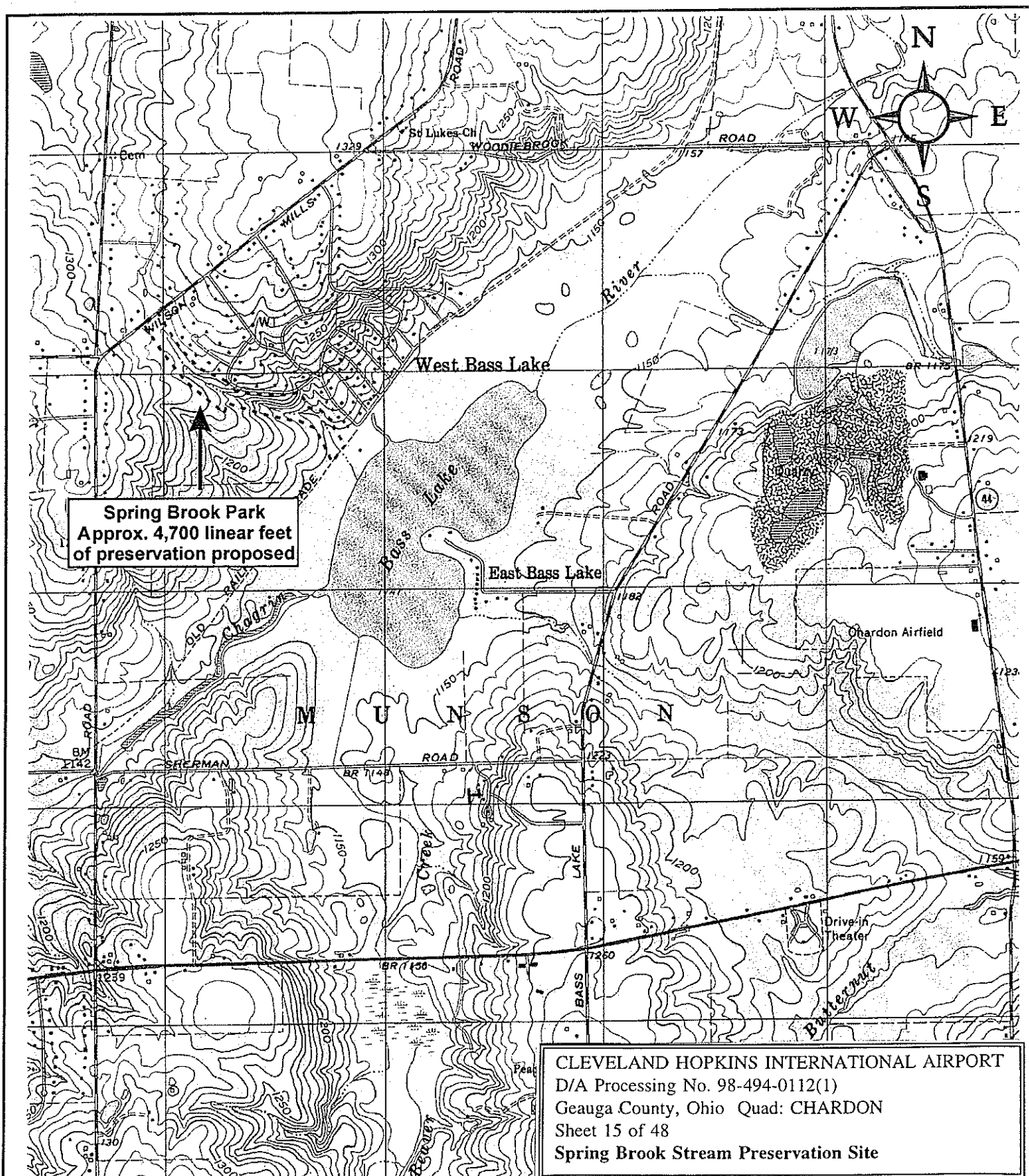
DATE: APR. 15, 1999
 APPROVED: [Signature]
 JOB NO.: [Number]
 DRAWN: [Name]
 M.S.G.

SCALE: 1" = 800'
 GRAPHIC SCALE IN FEET
 0 800' 1000' 2000'
 SQUARE
 GRAPHIC SCALE IN FEET
 0 800' 1000' 2000'



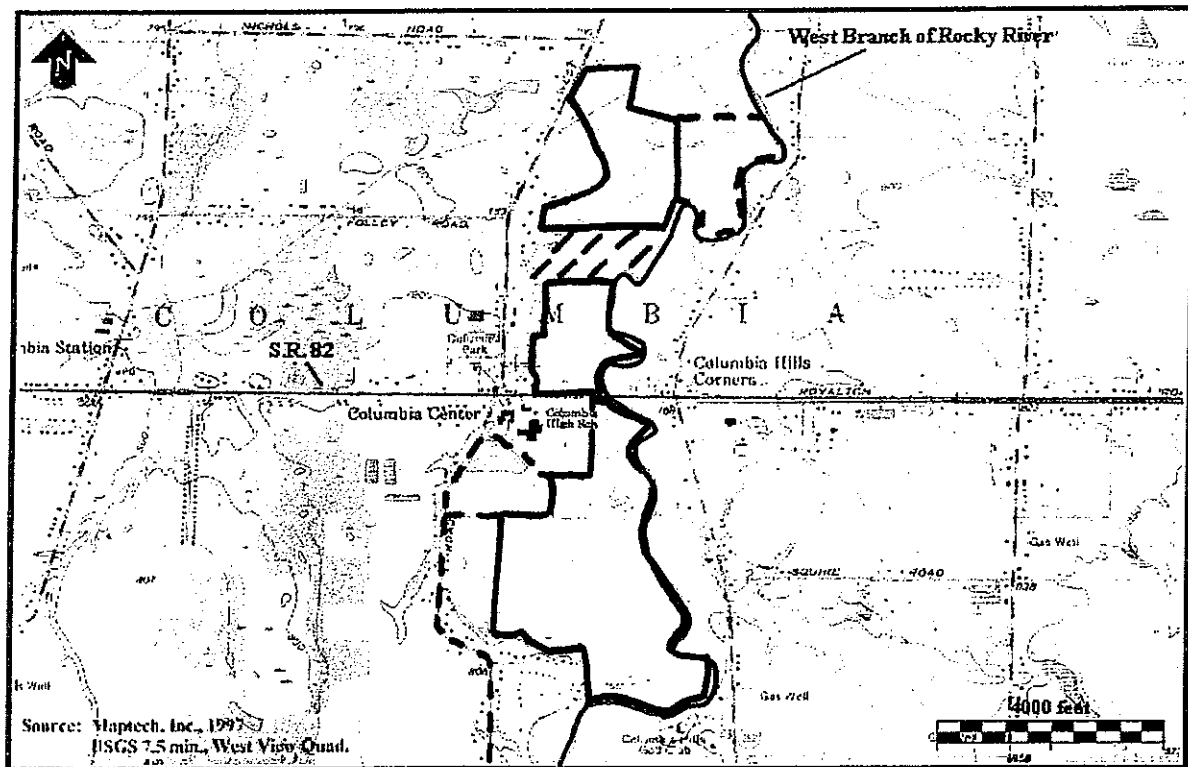
**Cleveland Hopkins International Airport
Proposed Stream Mitigation Site
Elk Creek**

**USGS 7.5' Topographic Map
Oberlin, Ohio Quadrangle
LaGrange Township, Lorain County
Photorevised 1979
Scale: 1:24,000**



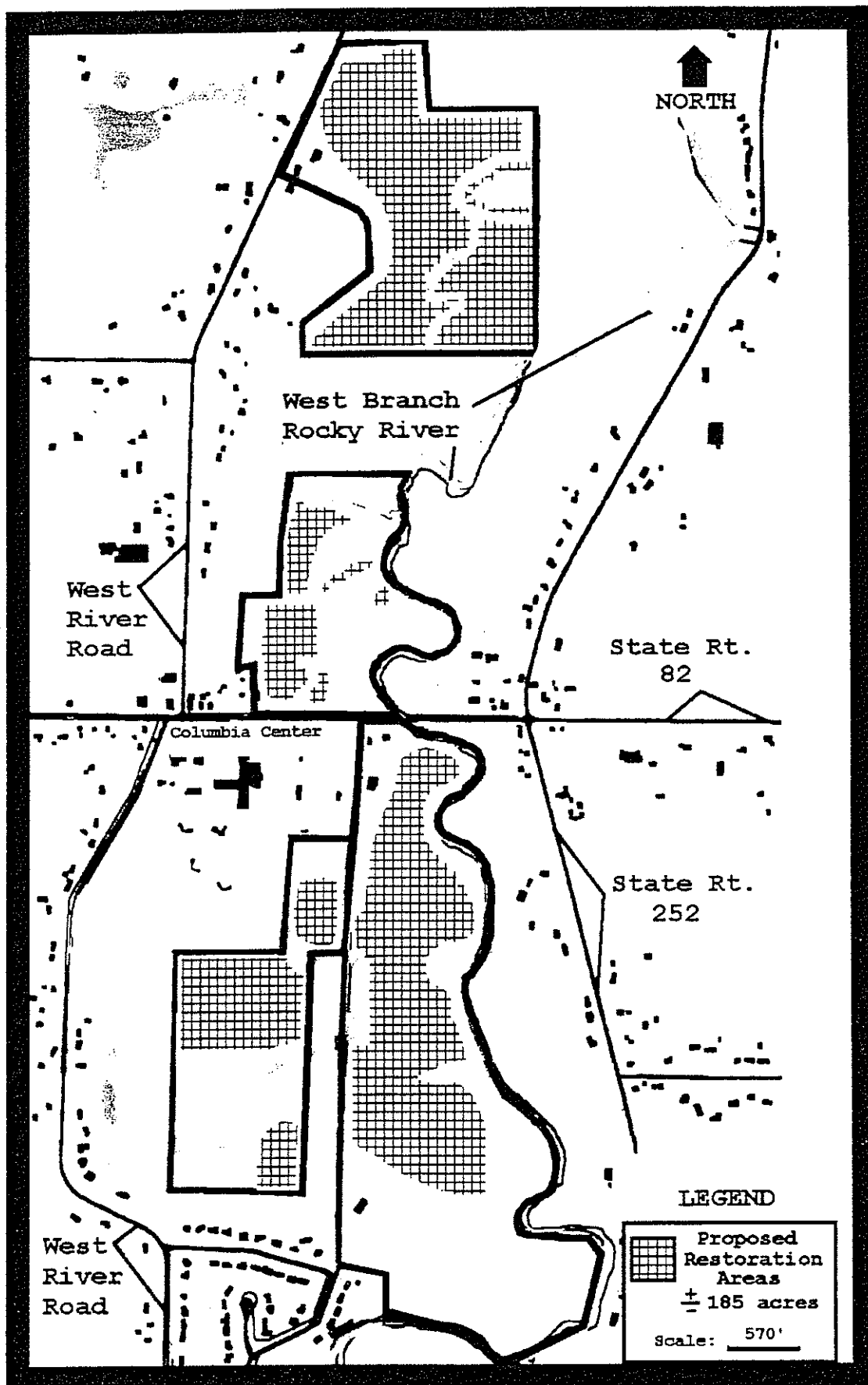
Cleveland Hopkins International Airport
Proposed Stream Preservation Site
Spring Brook Park

USGS 7.5' Topographic Map
Chardon, Ohio Quadrangle
Munson Township, Geauga County
1994
Scale: 1:24,000



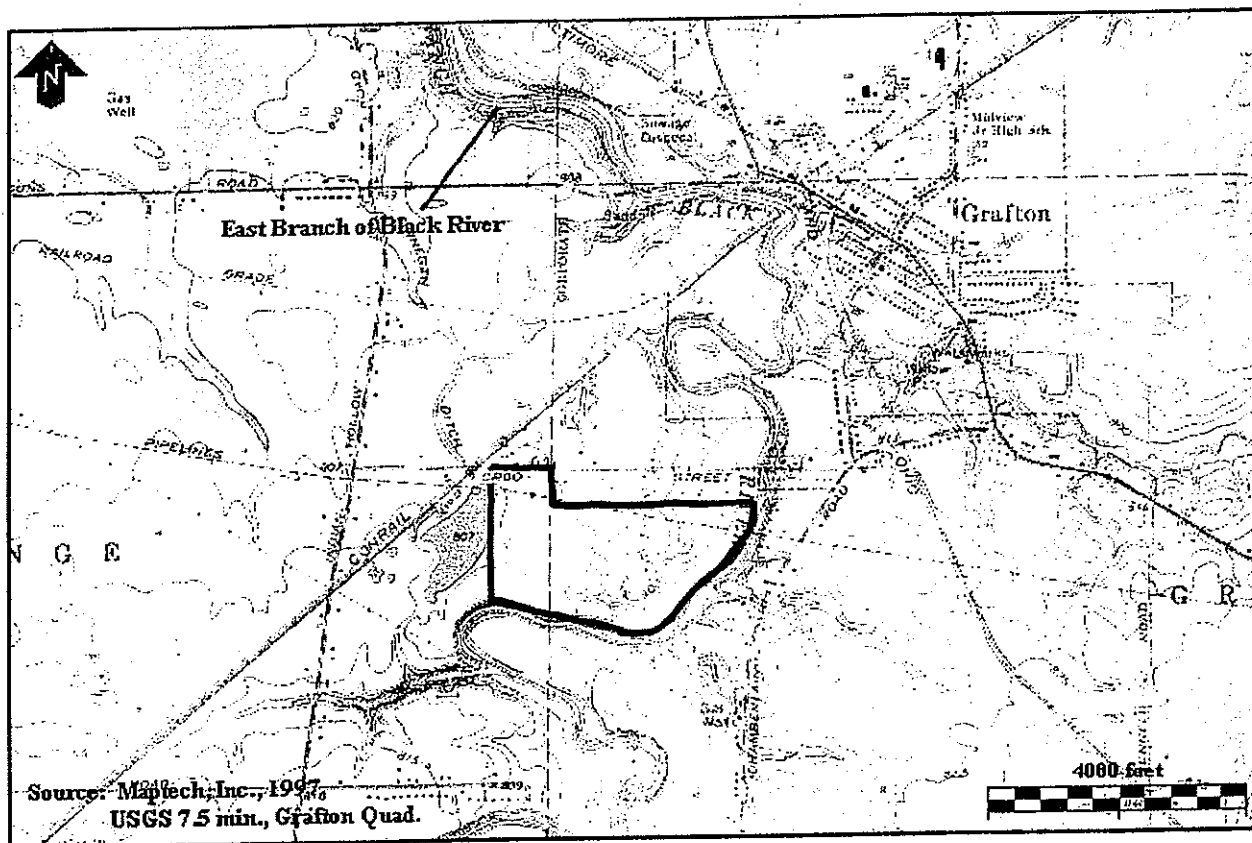
CLEVELAND HOPKINS INTERNATIONAL AIRPORT
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 Lorain County, Ohio Quad: WEST VIEW
 Sheet 16 of 48
 LCMP Columbia Wetland Restoration Sites

Figure 2: USGS topographic map of Columbia Township mitigation sites



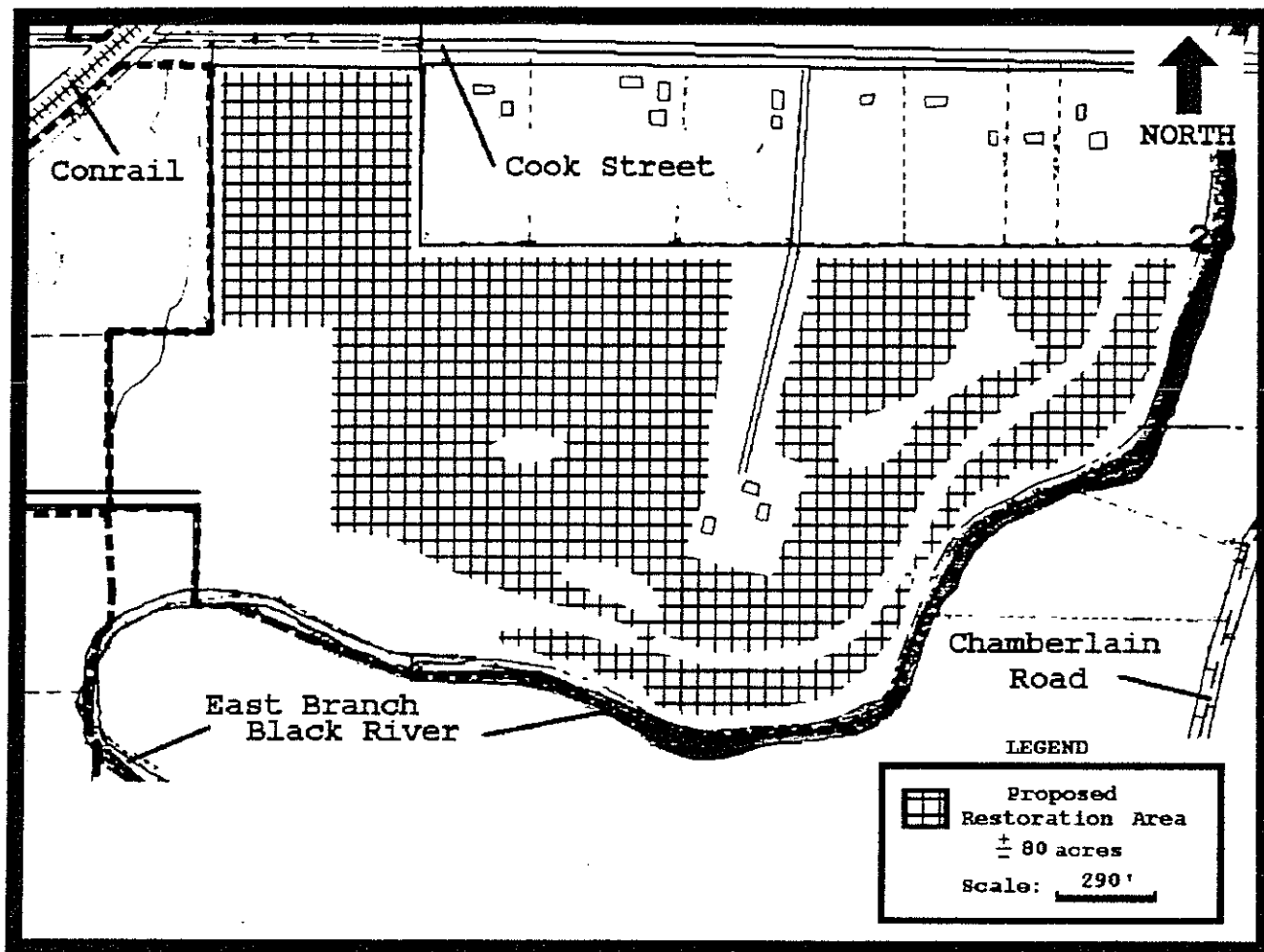
CLEVELAND HOPKINS INTERNATIONAL AIRPORT
D/A Processing No. 98-494-0112(1)
Lorain County, Ohio Quad: WEST VIEW
Sheet 17 of 48
Columbia Wetland Restoration - Details

Figure 6, Sheet 8: Approximate Restoration / Enhancement Acres at Columbia Township



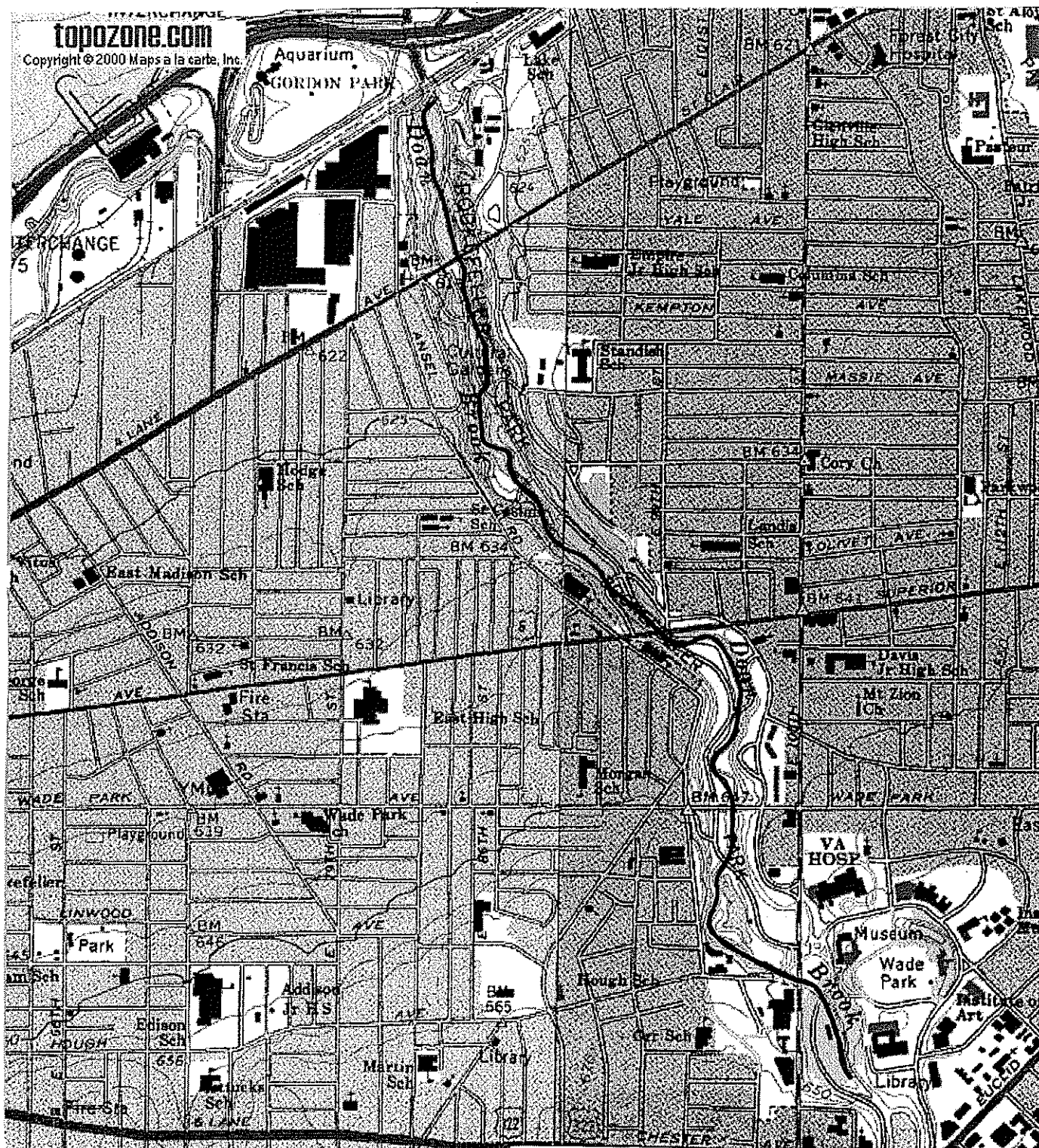
CLEVELAND HOPKINS INTERNATIONAL AIRPORT
D/A Processing No. 98-494-0112(1)
Lorain County, Ohio Quad: GRAFTON
Sheet 18 of 48
LCMP LaGrange Wetland Restoration Site

Figure 2a: USGS topographic map of LaGrange Township mitigation site

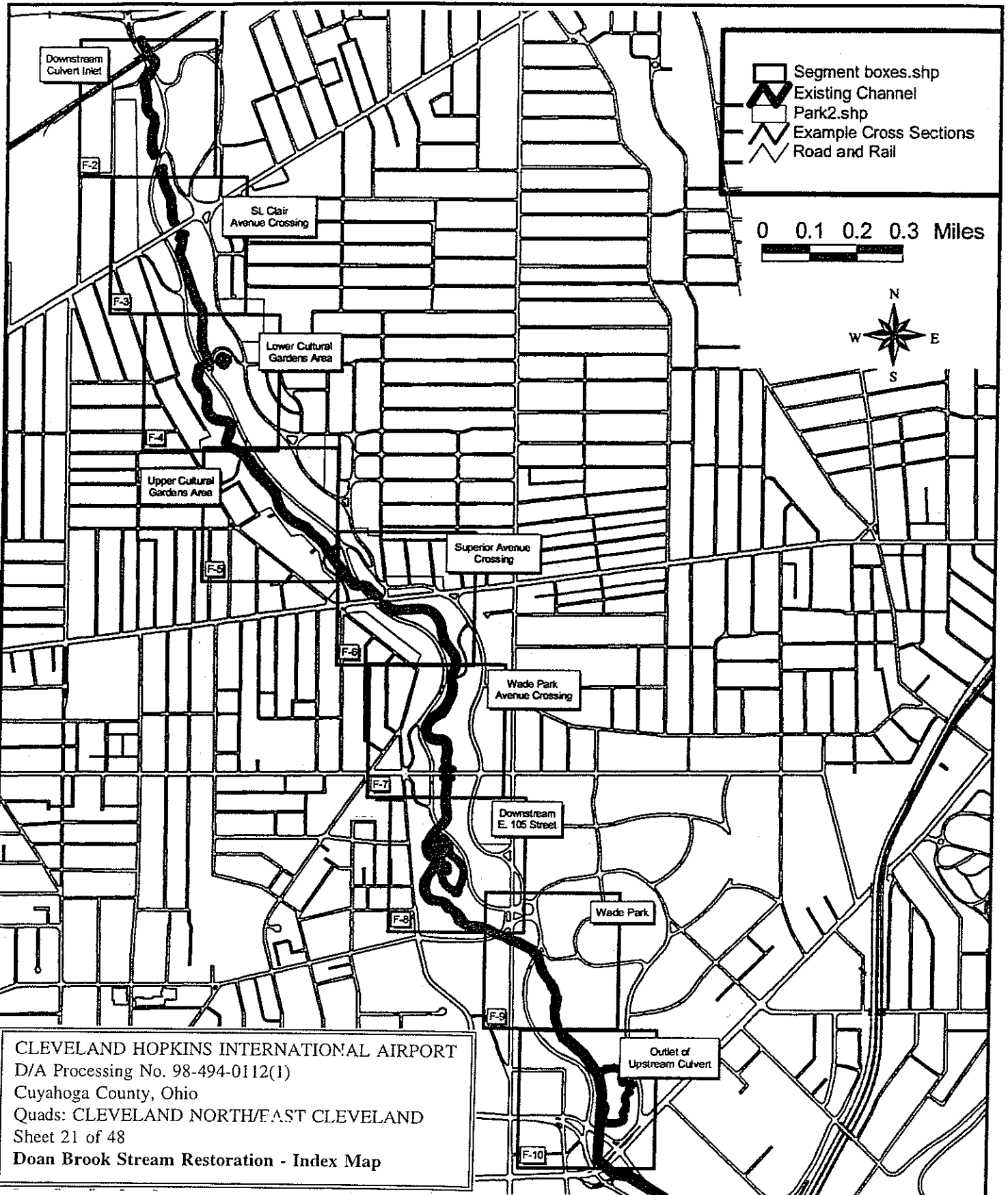


CLEVELAND HOPKINS INTERNATIONAL AIRPORT
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 Lorain County, Ohio Quad: Grafton
 Sheet 19 of 48
 LaGrange Wetland Restoration - Details

Figure 6, Sheet 9: Approximate Restoration acres at LaGrange Township



CLEVELAND HOPKINS INTERNATIONAL AIRPORT
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Cuyahoga County, Ohio
Quads: CLEVELAND NORTH/EAST CLEVELAND
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Doan Brook Stream Restoration Site

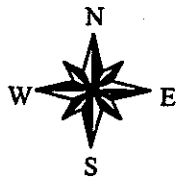


Modifications: (feet)
East Bank: 770.0
West Bank: 428.1
Instream: 957.08

Culvert Inlet
to Lake Erie

1400

Instream Retention
Provided by Wider
Flood Channel



- Wetland Area
- Example Cross Sections
- Instream Modifications
- Existing Channel
- Bank Modification Areas
- 2 Foot Contours
- Road and Rail

0 90 180 270 Feet

1500

Martain Luther King
Boulevard

5 year 6 hour storm
Currently Exceeds
height of bridge deck

1600

1700

CLEVELAND HOPKINS INTERNATIONAL AIRPORT
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Cuyahoga County, Ohio Quad: CLEVELAND N.
Sheet 22 of 48
Doan Brook Stream Restoration - Section 1

Note: Cross section detail is presented in the Section 404 Permit Application and has not been represented for this supplemental document.

Cleveland Hopkins International Airport

Downstream Culvert Inlet

Exhibit
F-2

CLEVELAND HOPKINS INTERNATIONAL AIRPORT
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 Cuyahoga County, Ohio Quad: CLEVELAND N.
 Sheet 23 of 48
 Doan Brook Stream Restoration - Section 2

Constructed Wetland
 In Riparian Floodplain








Modifications: (feet)
 East Bank: 1677.1
 West Bank: 1235.0
 Instream: 2006.37

St. Clair Avenue

Martain Luther King Boulevard

2000

Widen Flood Channel
 for Increased Retention

-  Wetland Area
-  Example Cross Sections
-  Instream Modifications
-  Existing Channel
-  Bank Modification Areas
-  2 Foot Contours
-  Road and Rail






0 90 180 270 Feet

Note: Cross section detail is presented in the Section 404 Permit Application and has not been represented for this supplemental document.

Cleveland Hopkins International Airport

St. Clair Avenue Crossing

Exhibit
 F-3

-  Wetland Area
-  Example Cross Sections
-  Instream Modifications
-  Existing Channel
-  Bank Modification Areas
-  2 Foot Contours
-  Road and Rail

Flood Channel Widened
for Instream Retention

2100

2300

Martain Luther King Boulevard

2400

2450

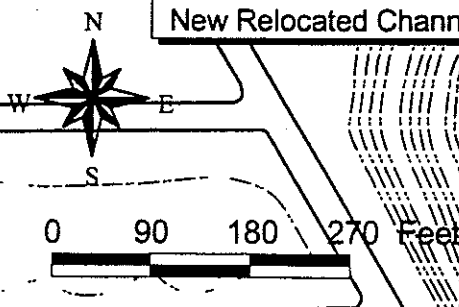
New Relocated Channel

Oxbow/Wetland
See Exhibit F-5

2500

Modifications: (feet)
East Bank: 369.0
West Bank: 435.8
Instream: 438.15

CLEVELAND HOPKINS INTERNATIONAL AIRPORT
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Cuyahoga County, Ohio Quad: CLEVELAND N.
Sheet 24 of 48
Doan Brook Stream Restoration - Section 3



Note: Cross section detail is presented in the Section 404 Permit Application and has not been represented for this supplemental document.

Cleveland Hopkins International Airport

Lower Cultural Gardens

Exhibit
F-4

2400



Oxbow Modifications: (feet)
 East Bank: 369.0
 West Bank: 435.8
 Instream: 438.15

Level Control Weir

2450

Open Water Pools
 Separated by Vortex
 Rock Weir Riffles

New Base Flow Channel

Inflow Control
 Rock Weir

CLEVELAND HOPKINS INTERNATIONAL AIRPORT
 D/A Processing No. 98-494-0112(1)
 Cuyahoga County, Ohio Quad: CLEVELAND N.
 Sheet 25 of 48
 Doan Brook Restoration - Section 3 (cont.)
 Proposed Oxbow Wetland Complex Details

0 40 80 120 Feet

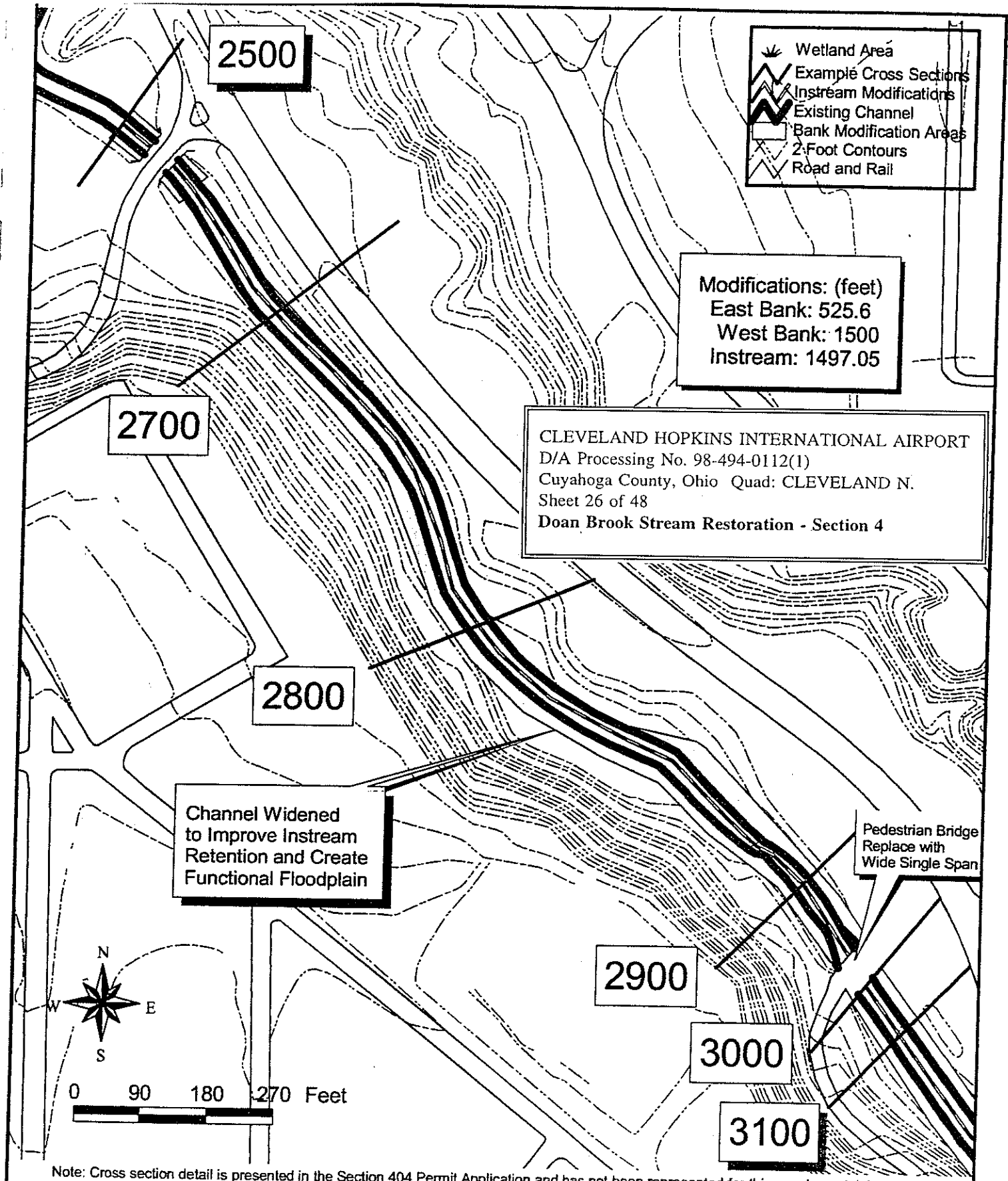
- Wetland Area
- Example Cross Sections
- Instream Modifications
- Existing Channel
- Bank Modification Areas
- 2 Foot Contours
- Road and Rail

Note: Cross section detail is presented in the Section 404 Permit Application and has not been represented for this supplemental document.

Cleveland Hopkins International Airport

Detail of Proposed Oxbow Wetland
 Complex at section 2450

Exhibit
 F-5



Note: Cross section detail is presented in the Section 404 Permit Application and has not been represented for this supplemental document.

Cleveland Hopkins International Airport

Upstream Cultural Gardens Area

Exhibit
F-6

3100

CLEVELAND HOPKINS INTERNATIONAL AIRPORT
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Cuyahoga County, Ohio Quad: E. CLEVELAND
Sheet 27 of 48
Doan Brook Stream Restoration - Section 5



3200

Superior Avenue

3600

Martain Luther King Boulevard

3700

Modifications: (feet)
East Bank: 1355.6
West Bank: 1595.5
Instream: 2003.27



0 90 180 270 Feet








Note: Cross section detail is presented in the Section 404 Permit Application and has not been represented for this supplemental document.

Cleveland Hopkins International Airport

Superior Avenue Crossing

Exhibit
F-7

CLEVELAND HOPKINS INTERNATIONAL AIRPORT
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 Cuyahoga County, Ohio Quad: E. CLEVELAND
 Sheet 28 of 48
 Doan Brook Stream Restoration - Section 6

-  Wetland Area
-  Example Cross Sections
-  Instream Modifications
-  Existing Channel
-  Bank Modification Areas
-  2 Foot Contours
-  Road and Rail

Modifications: (feet)
 East Bank: 1084.2
 West Bank: 1662.6
 Instream: 1657.01

3900

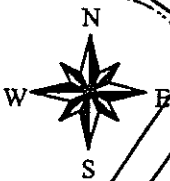
3800

New Base Flow Channel

3950

Wetland

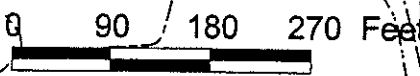
Oxbow Wetlands Complex
 See F-5 for example of Oxbow Detail



4000

Wade Park Avenue

4200

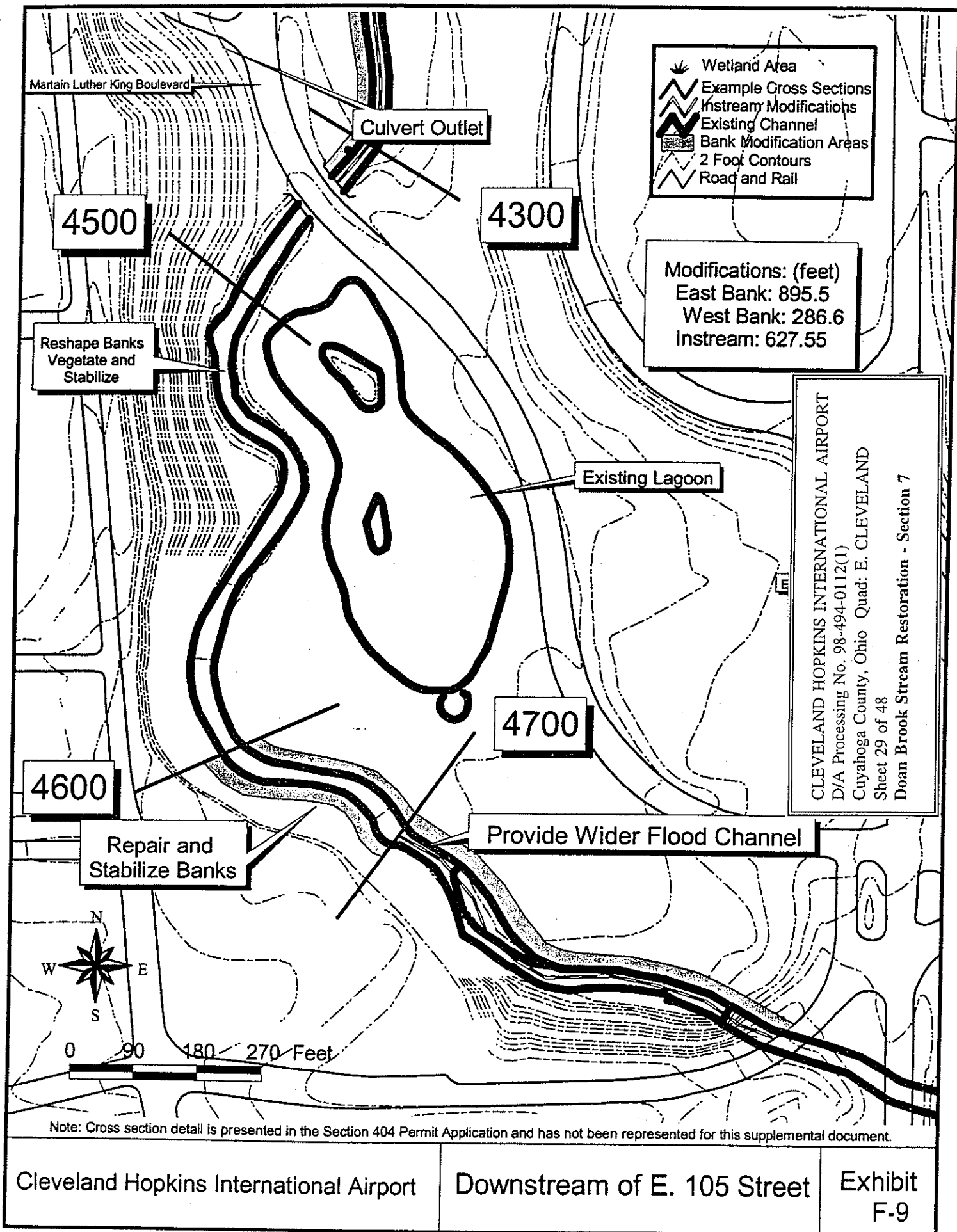


Note: Cross section detail is presented in the Section 404 Permit Application and has not been represented for this supplemental document.

Cleveland Hopkins International Airport

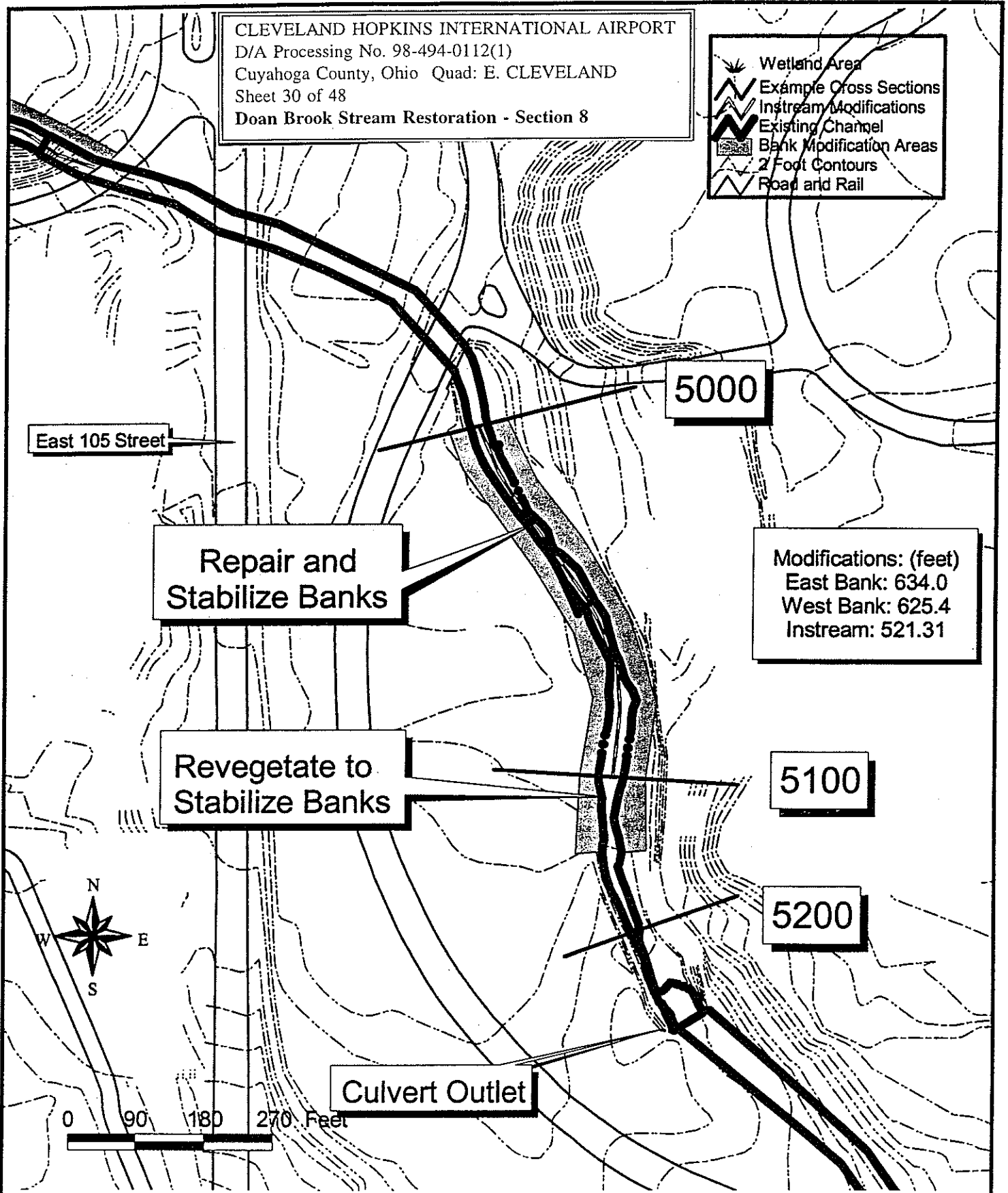
Wade Park Avenue Crossing

Exhibit
 F-8



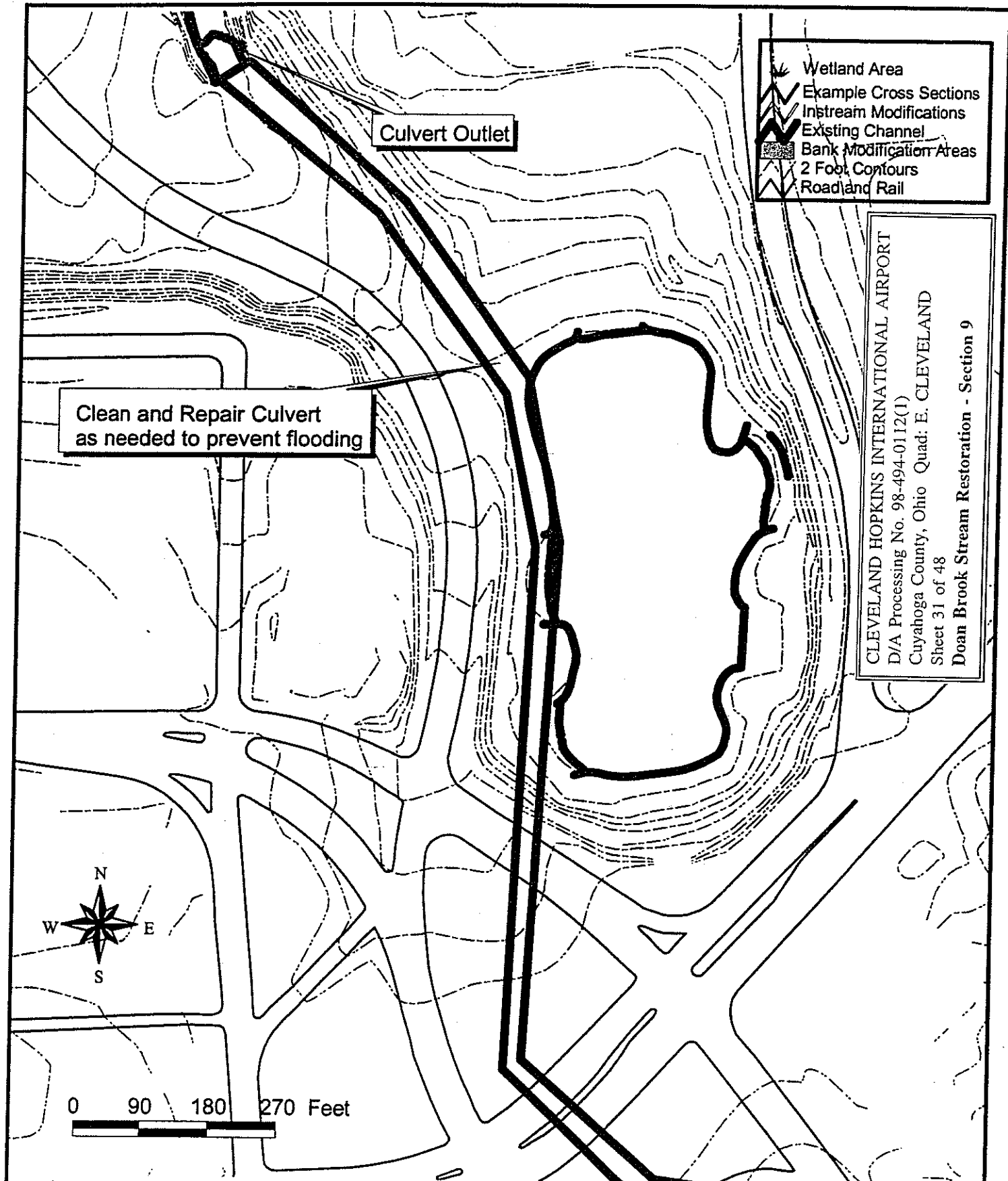
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 Cuyahoga County, Ohio Quad: E. CLEVELAND
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Doan Brook Stream Restoration - Section 8

-  Wetland Area
-  Example Cross Sections
-  Instream Modifications
-  Existing Channel
-  Bank Modification Areas
-  2 Foot Contours
-  Road and Rail



Modifications: (feet)
 East Bank: 634.0
 West Bank: 625.4
 Instream: 521.31

Note: Cross section detail is presented in the Section 404 Permit Application and has not been represented for this supplemental document.

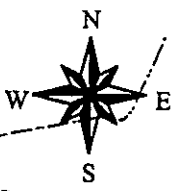


- Wetland Area
- Example Cross Sections
- Instream Modifications
- Existing Channel
- Bank Modification Areas
- 2 Foot Contours
- Roadland Rail

Clean and Repair Culvert
as needed to prevent flooding

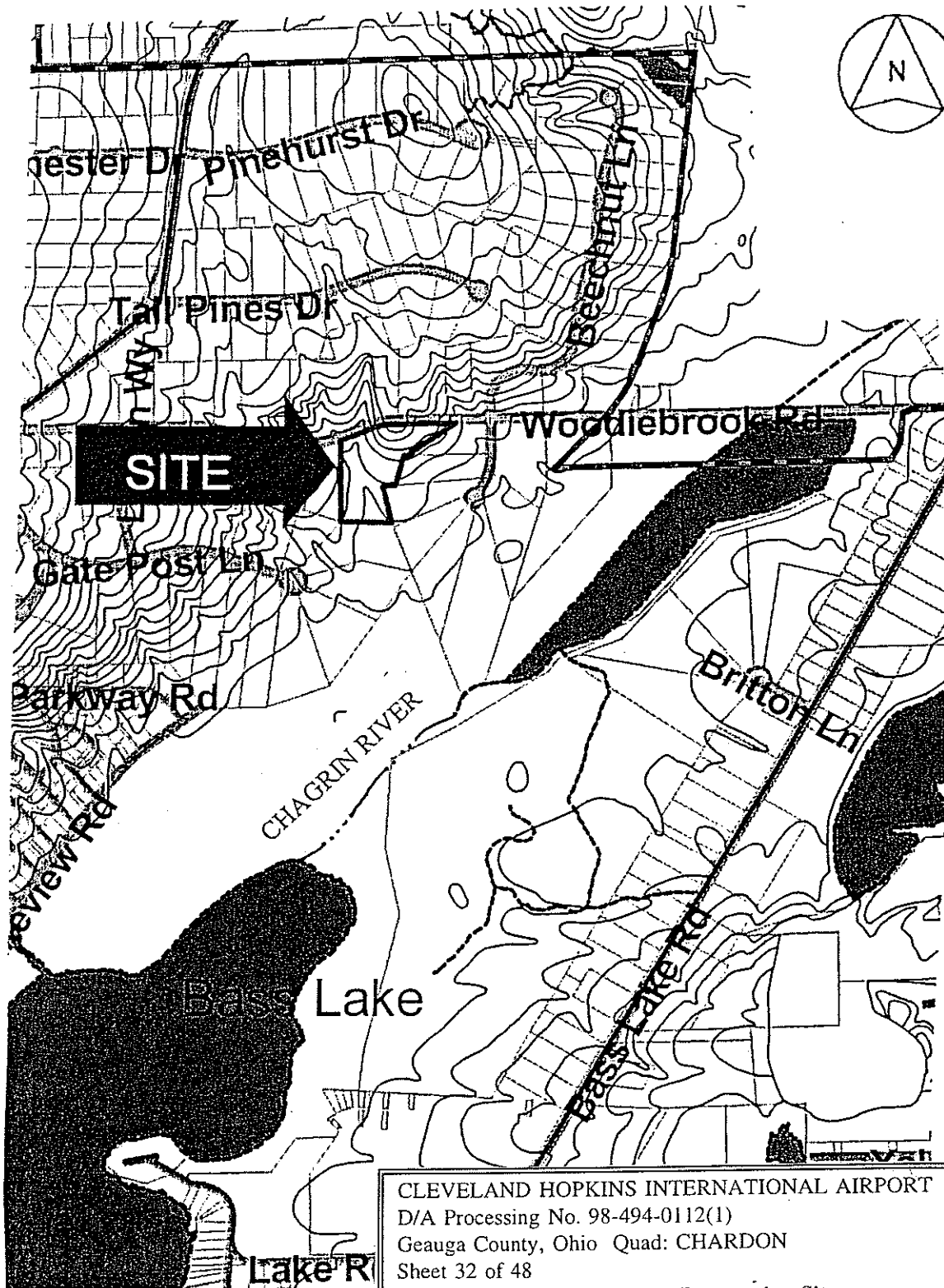
Culvert Outlet

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Doan Brook Stream Restoration - Section 9



0 90 180 270 Feet

Note: Cross section detail is presented in the Section 404 Permit Application and has not been represented for this supplemental document.



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 Woodiebrook Creek Stream Restoration Site

U.S.G.S. MAP FIGURE 1

PROJECT: WOODIEBROOK STREAM RESTORATION
 LOCATION: MUNSON TOWNSHIP, OHIO

CHAGRIN VALLEY
 ENGINEERING, LTD.

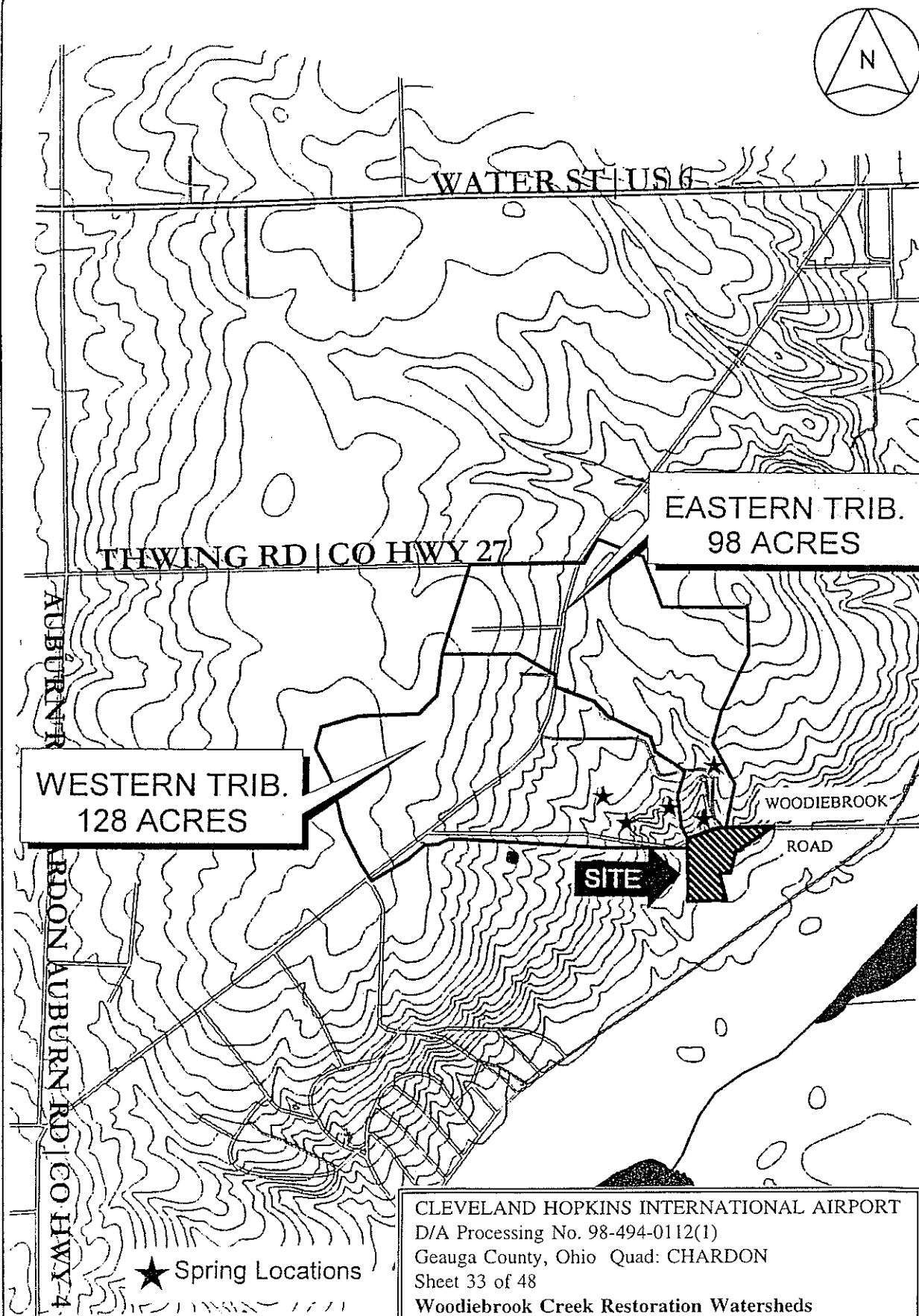
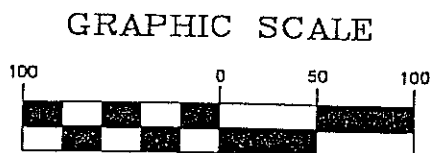


FIGURE 2
SITE DRAINAGE

PROJECT: WOODIEBROOK STREAM RESTORATION
LOCATION: MUNSON TOWNSHIP, OHIO



EXISTING TRIBUTARIES SPRING
FED, SEE FIGURE 2 FOR APPROX.
SPRING LOCATIONS



(IN FEET)
1 inch = 100 ft.

WOODIEBROOK ROAD

PROPERTY LINE

EXISTING POND
WE 1170.5

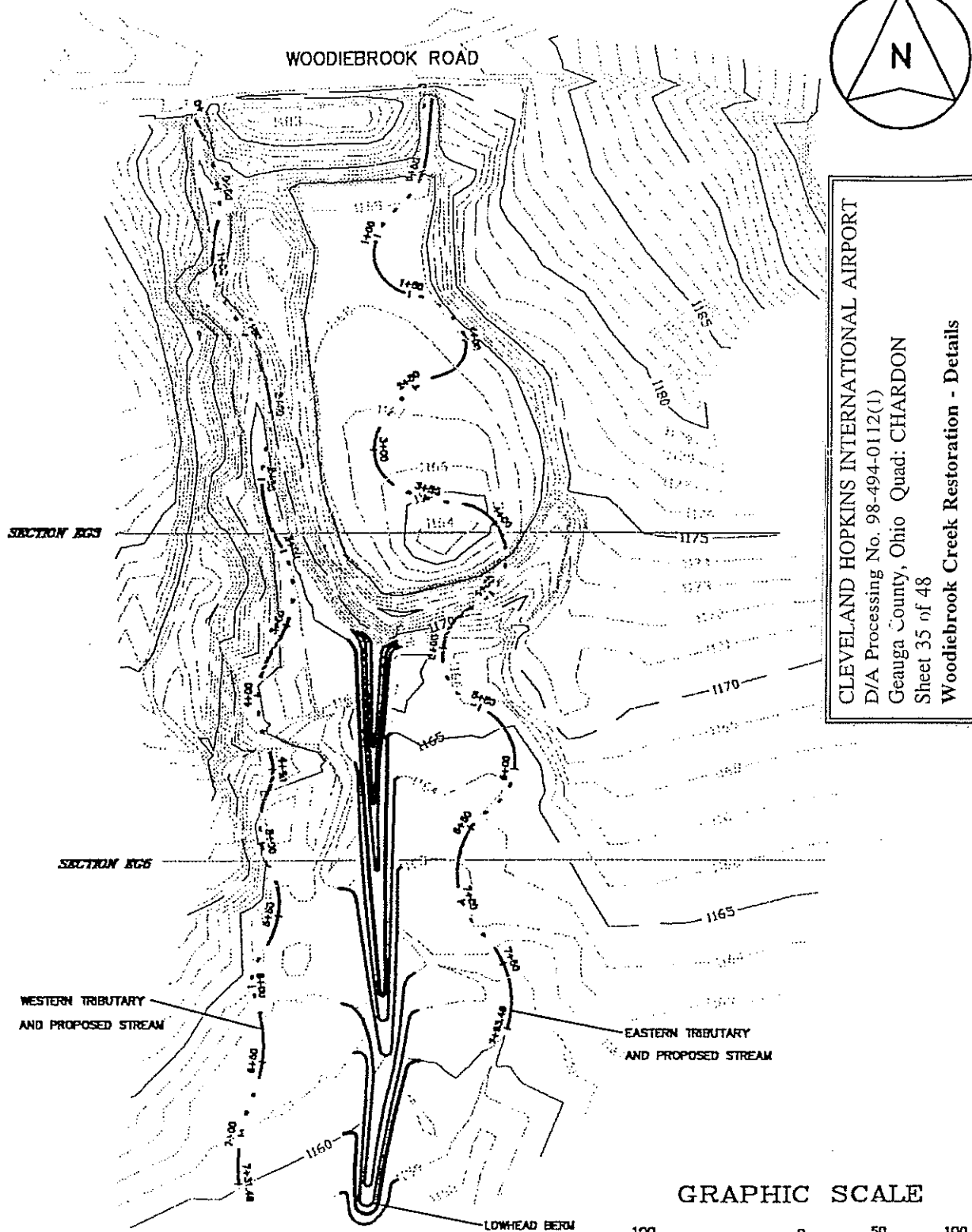
PROPERTY LINE

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Woodiebrook Creek Restoration - Details

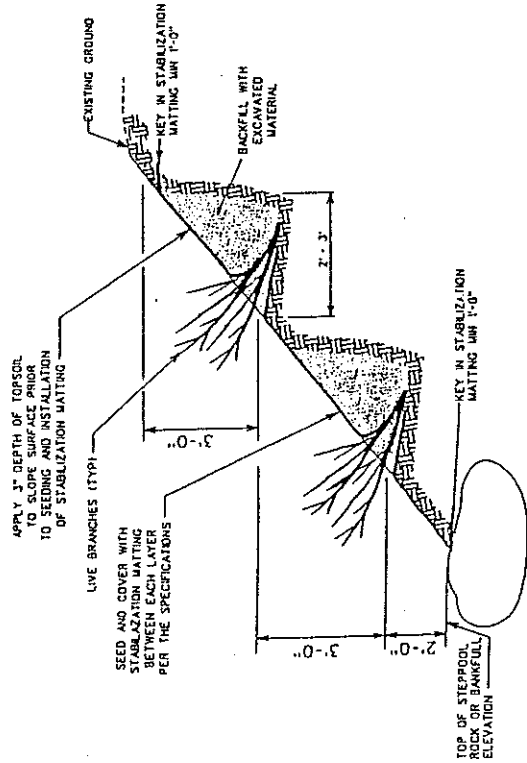
LEGEND

- PROPERTY LINE
- - - - - PROPOSED STREAM
- EXISTING STREAM
- ABANDONED CHANNEL
- EXISTING WETLAND BOUNDARY
- X TREE TO BE REMOVED
- [Stippled Box] ROOT WAD BANK PROTECTION

012che EXISTING TREE SIZE (INCHES) AND TYPE

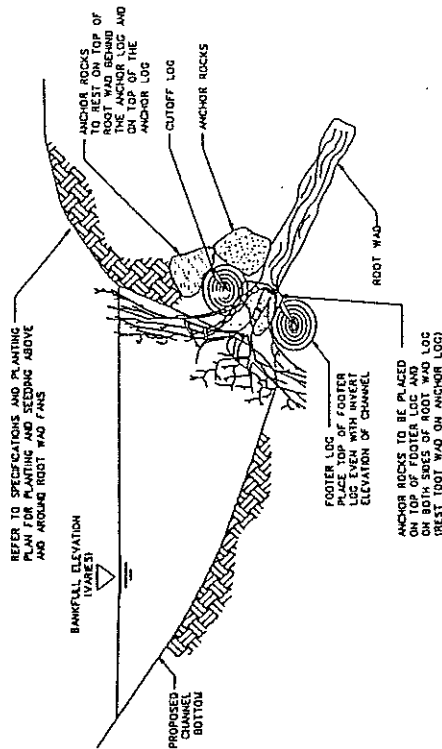


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 Woodiebrook Creek Restoration - Details



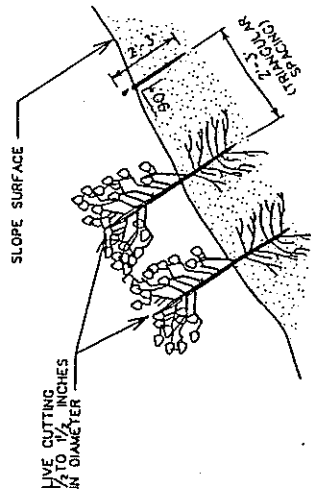
LIVE BRANCH LAYERING
CROSS SECTION - TYPICAL

NOT TO SCALE



ROOT WAD
CROSS SECTION

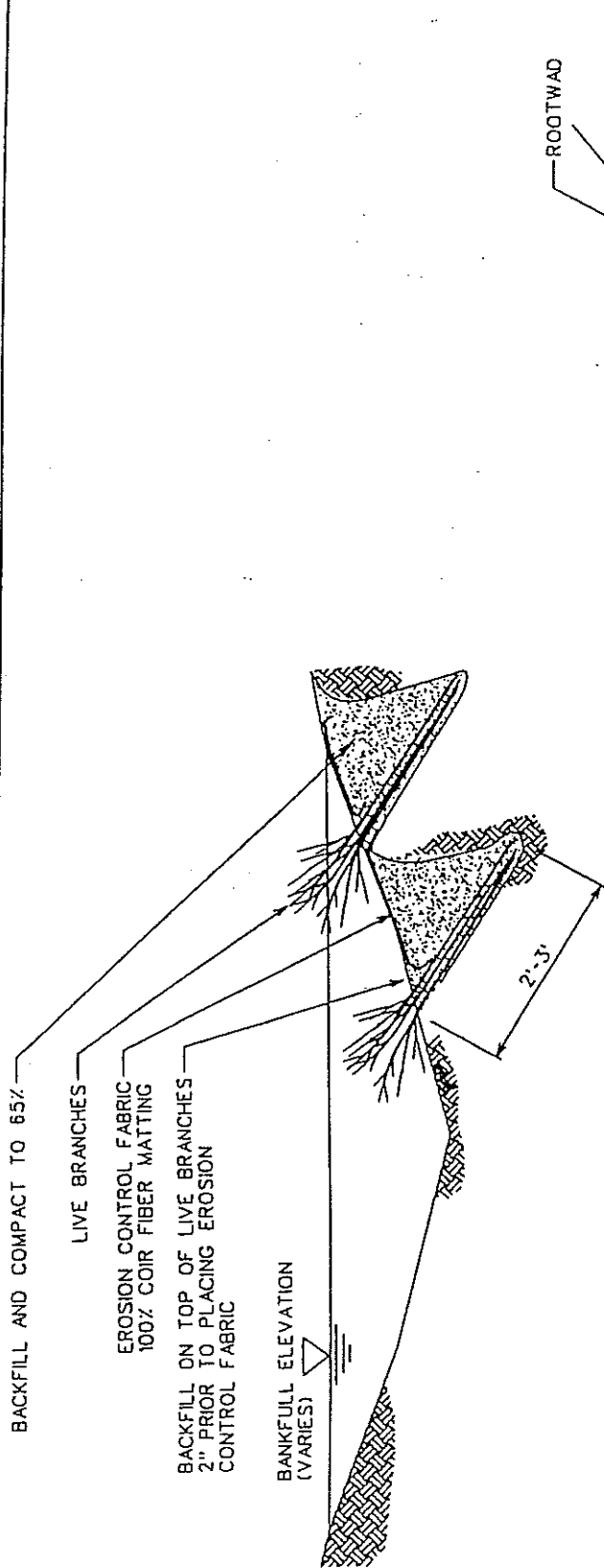
NOT TO SCALE



LIVE STAKE INSTALLATION
CROSS SECTION

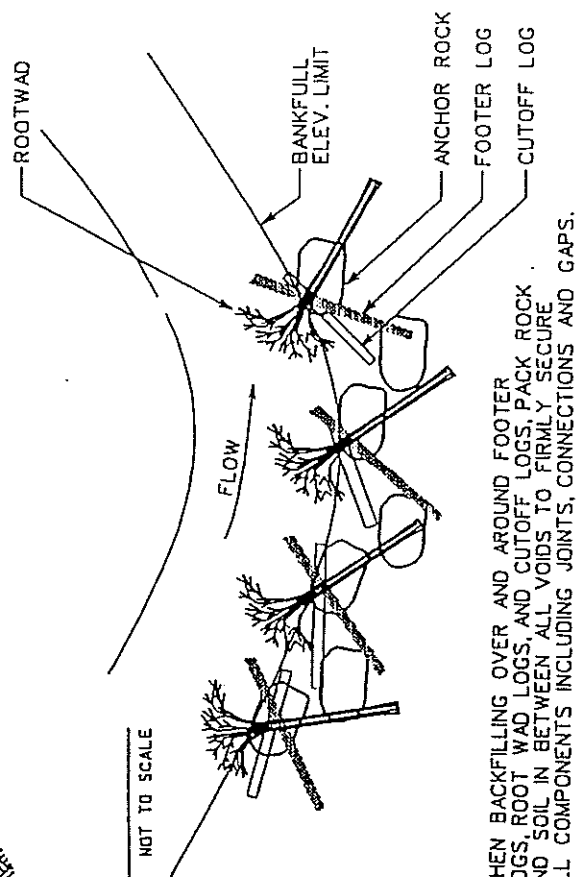
NOT TO SCALE

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Woodbrook Creek Restoration
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LIVE BRANCH LAYERING
CROSS SECTION

NOT TO SCALE



ROOTWADS REVETMENT
PLAN VIEW

NOT TO SCALE

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Woodiebrook Creek Restoration
Bioengineering Techniques - Details



PROJECT: WOODIEBROOK STREAM RESTORATION
LOCATION: CHARDON, OHIO

BIOENGINEERING
TECHNIQUES

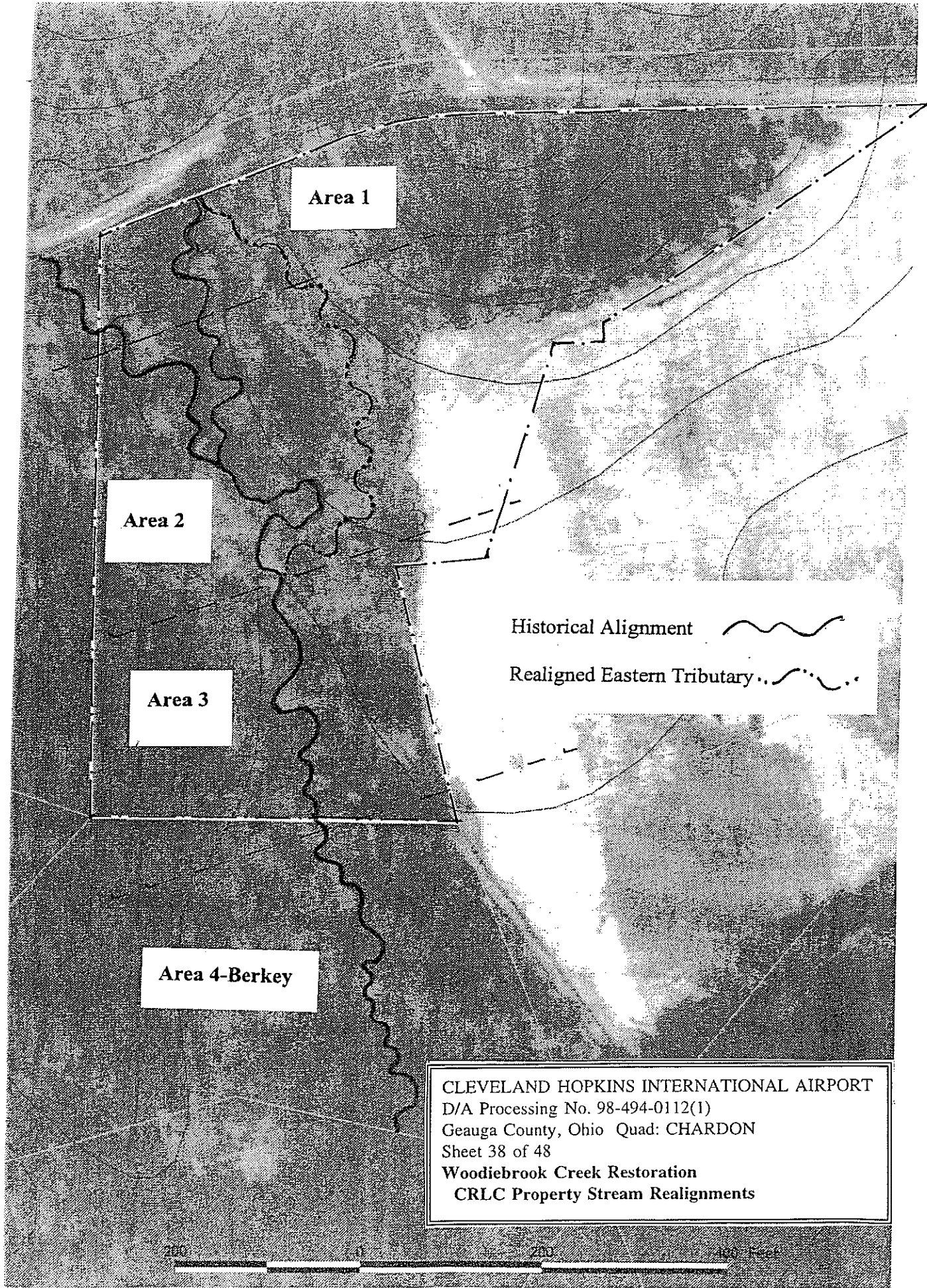


Figure 4- Historical (1990) and Proposed Stream alignments
Valley Gradient Sections- Woodiebrook

Woodiebrook Rd

START

CONFLUENCE
SITE

CRLC

BERKEY

BRUNO


C


D

CLEVELAND HOPKINS INTERNATIONAL AIRPORT
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Woodiebrook Creek Stream Restoration
Berkey Property - Modified Alignment

150 0 150 300 Feet

 Old Channel

 150' buffer

 100' buffer

 *Phagrin River*
LAND CONSERVANCY

Woodiebrook

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Abram Creek Preservation Site
(City of Cleveland Property Only)

Airport Property to Metroparks
2380 Feet

Culvert to Airport Property
1070 Feet

Culvert

LEGEND

 Metroparks
 Airport Property

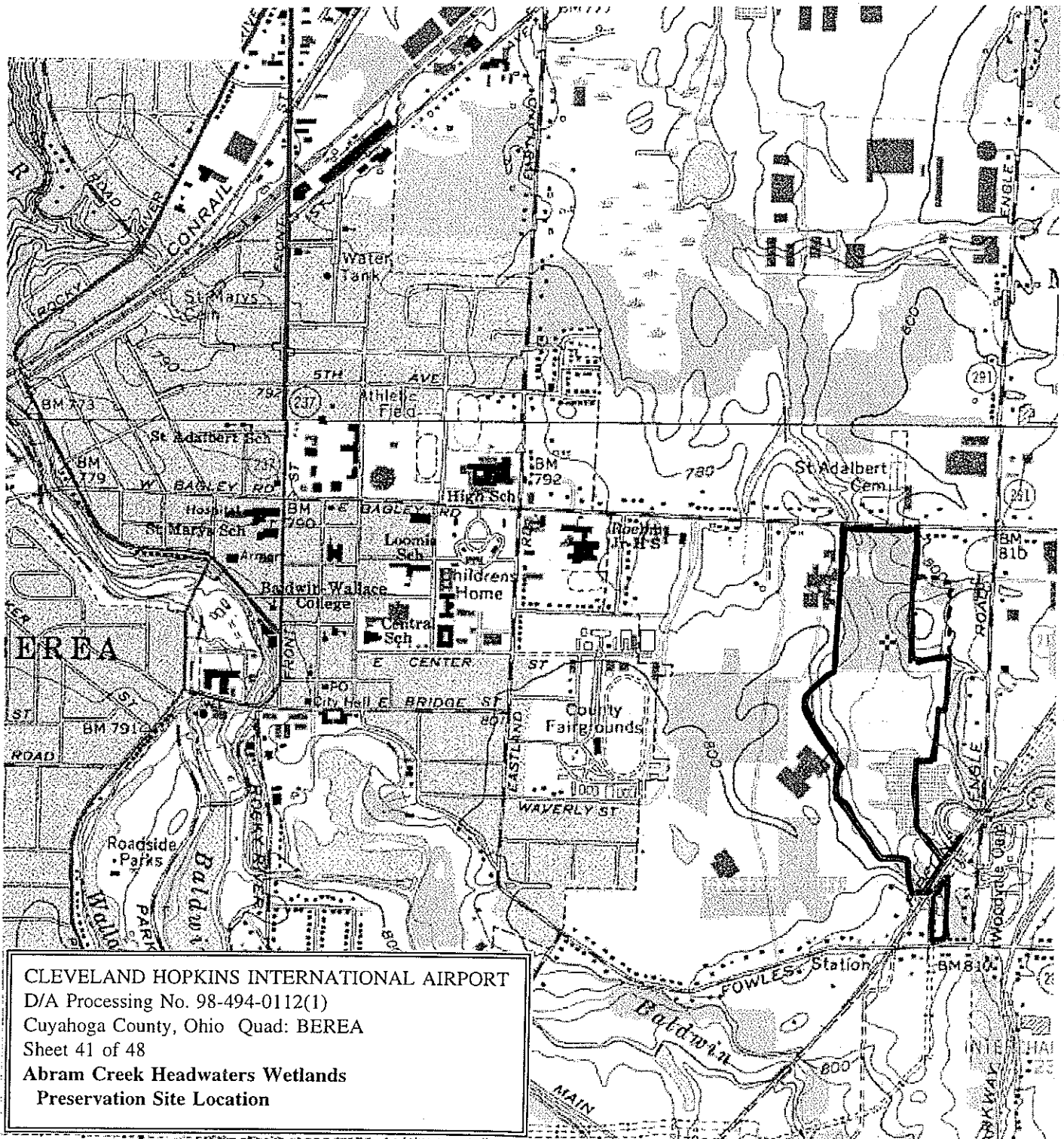
0 1000 Feet

Cleveland Hopkins
International Airport

Proposed Abram Creek Conservation Sites

Exhibit:
1

Target is UTM 17 430662E 4579783N - BERE A quad [Quad Info]



0 500 1000 1500 2000
meters
0 0.5 1.0
miles



Wetland/Stream Protection Southwest General Hospital Area

Map B

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Abram Creek Headwaters Wetlands

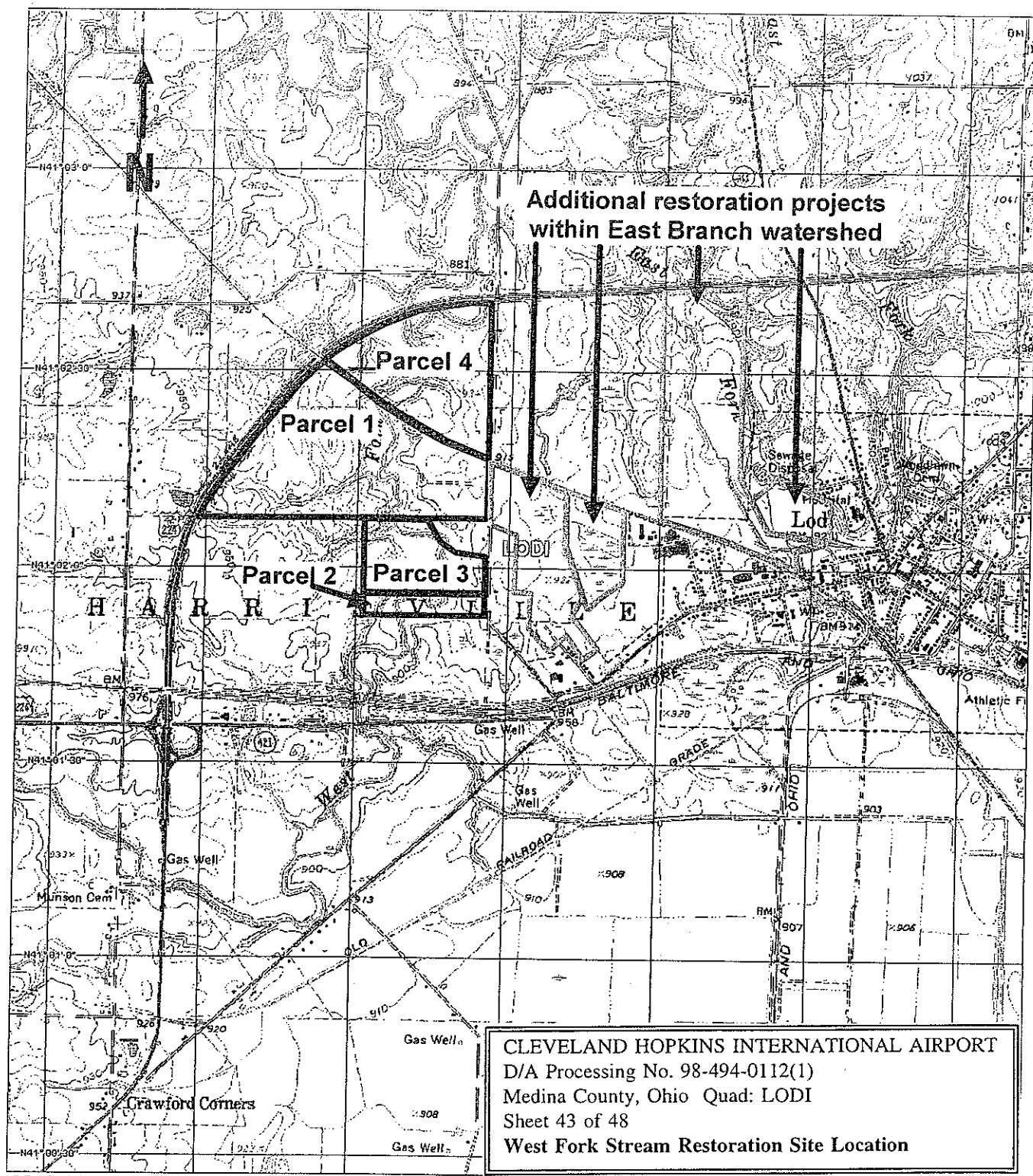
Preservation Site - Details



- Cleveland Metroparks Property
- Property Lines
- Wetland Area
- Protection Area
- Additional Protection Area
- Hydrography
- 10' Contours

400 0 400 Feet

Source: Tom Stanley
Chief of Natural Resources
Cleveland Metroparks
(216)635-3240



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

693 ft Scale: 1 : 24,000 Detail: 13.0 Datum: WGS84

Source: DeLorme 3-D Topo Quads

Scale: 1" = approx. 2250'

Figure 2. Project area parcel numbers, locations, and approximate boundaries

Typical Demonstration Features / Best Management Practices

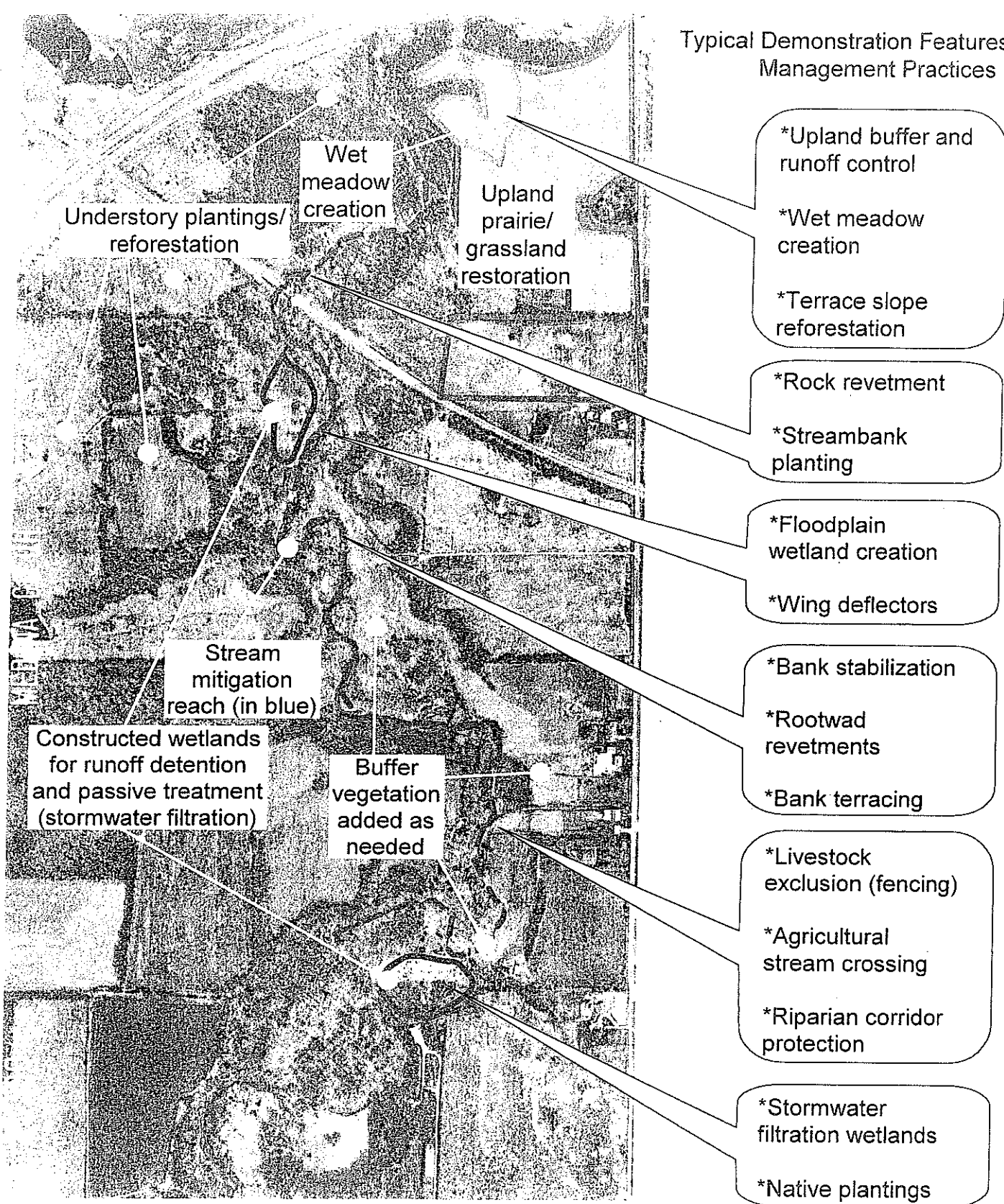
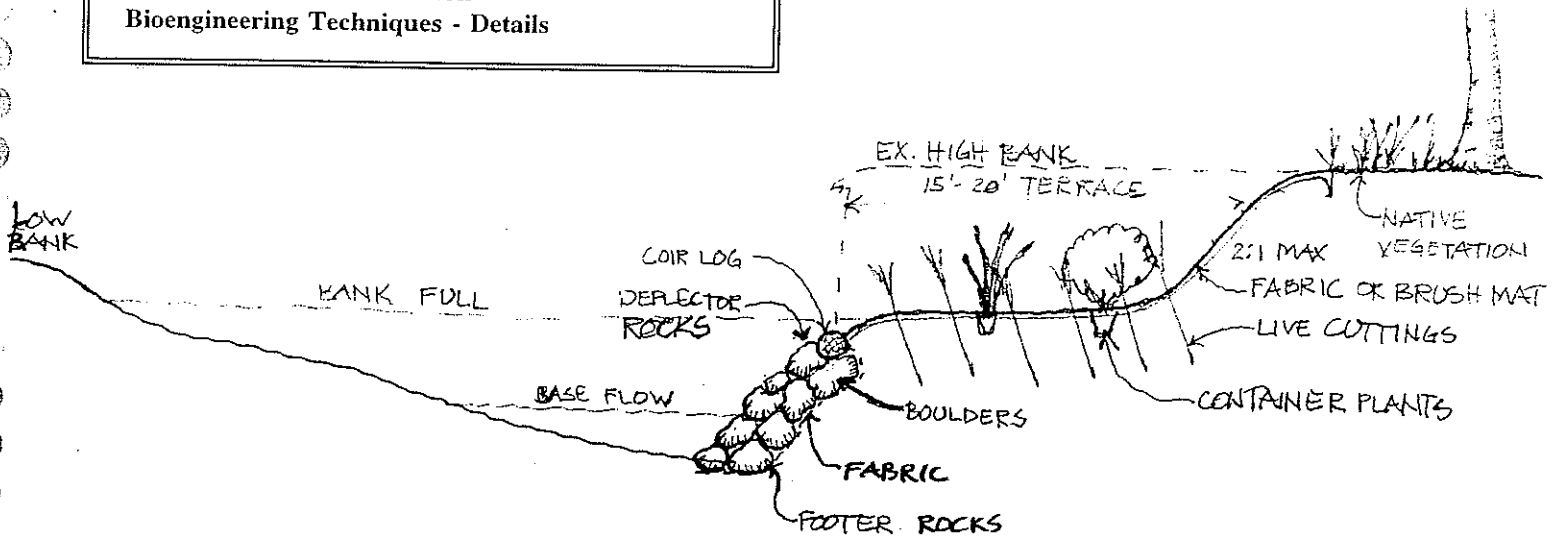


Figure 5. Existing land use and restoration plan schematic

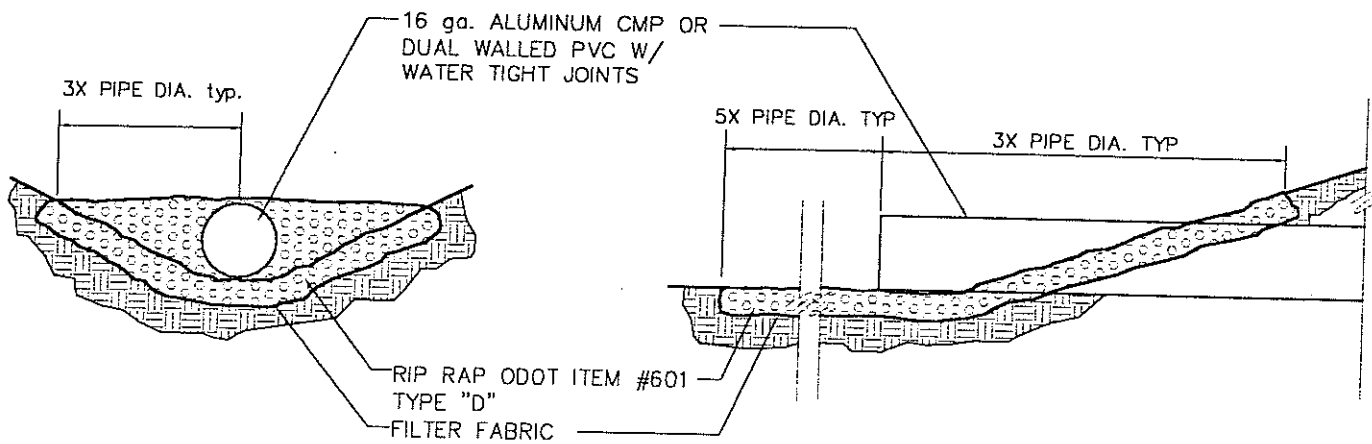
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West Fork Stream Restoration - Details

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TERRACED BANKS AND ROCK REVETMENT

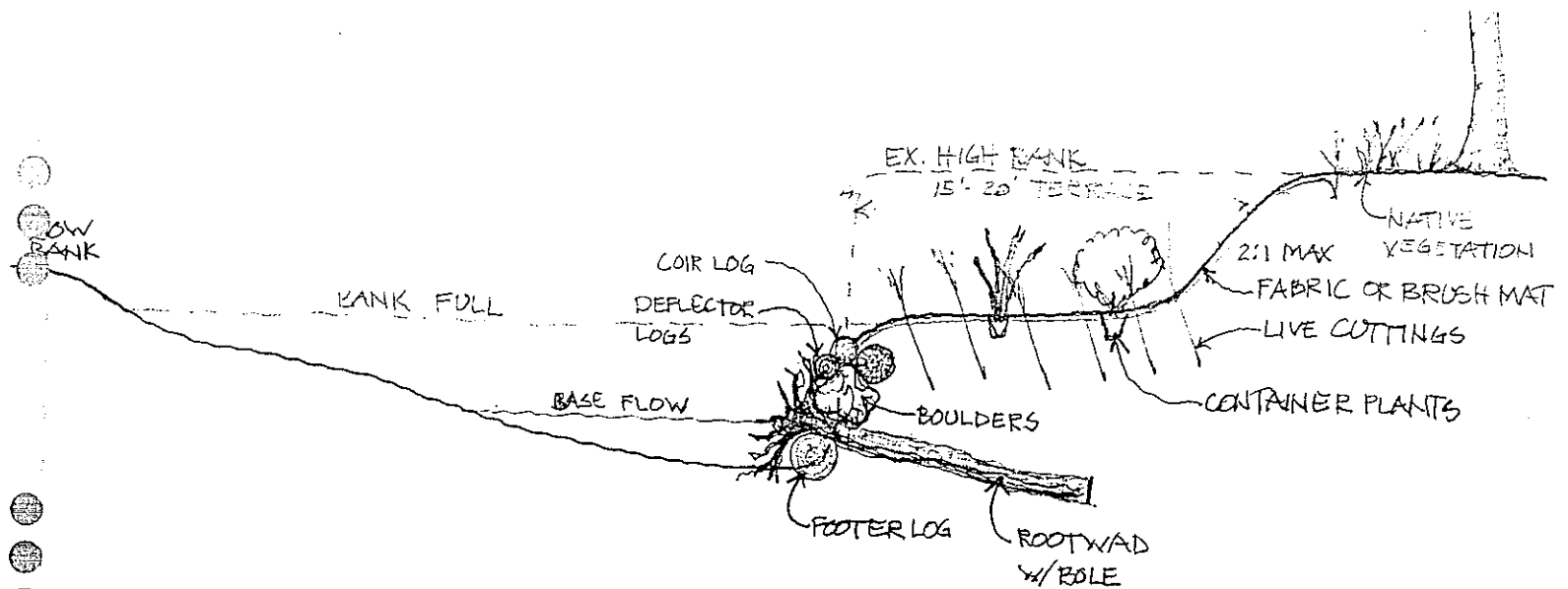
NTS



ELEVATION

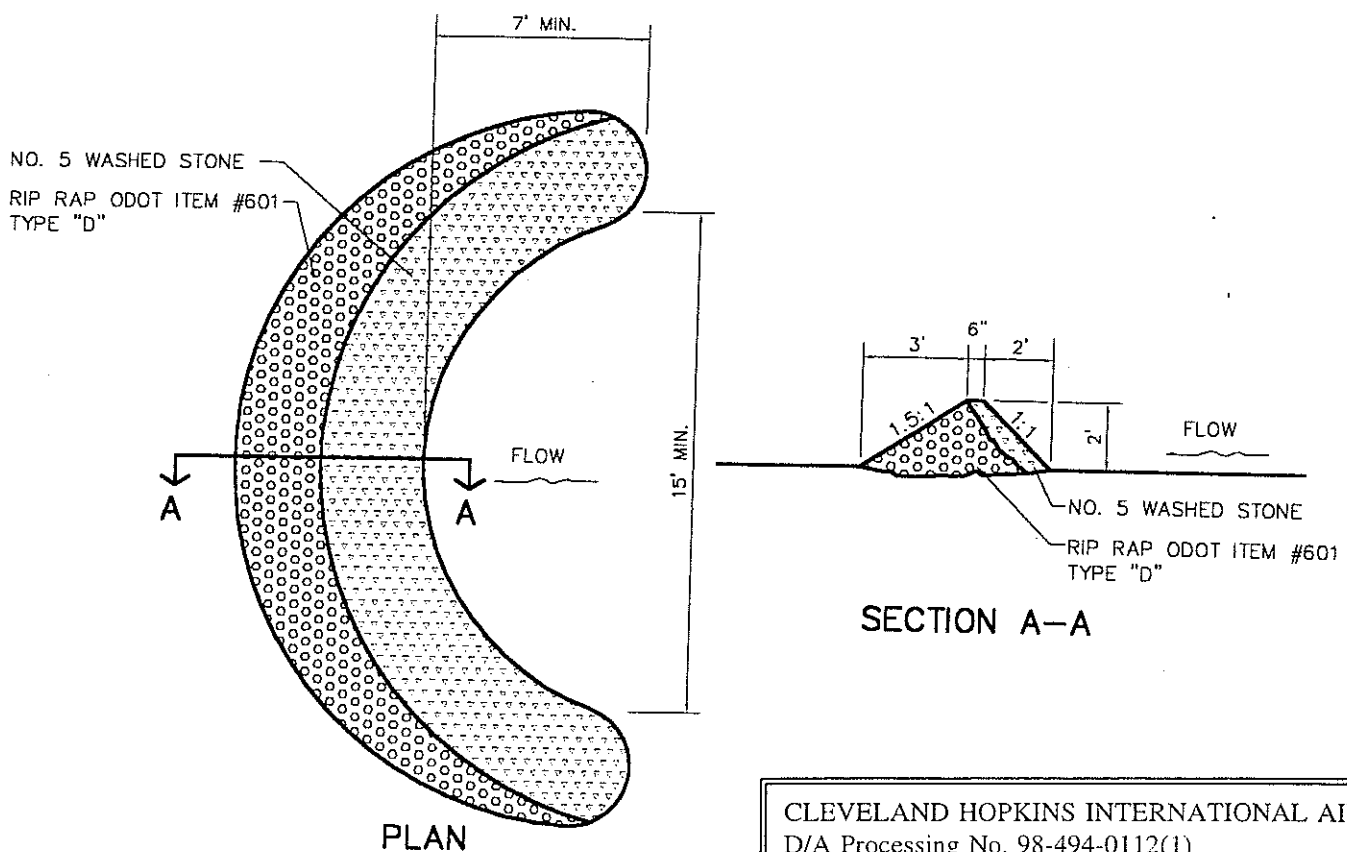
SECTION

(C) RIP RAP CHANNEL & OUTLET PROTECTION
 NOT TO SCALE



TERRACED BANKS AND ROOT WAD REVETMENT

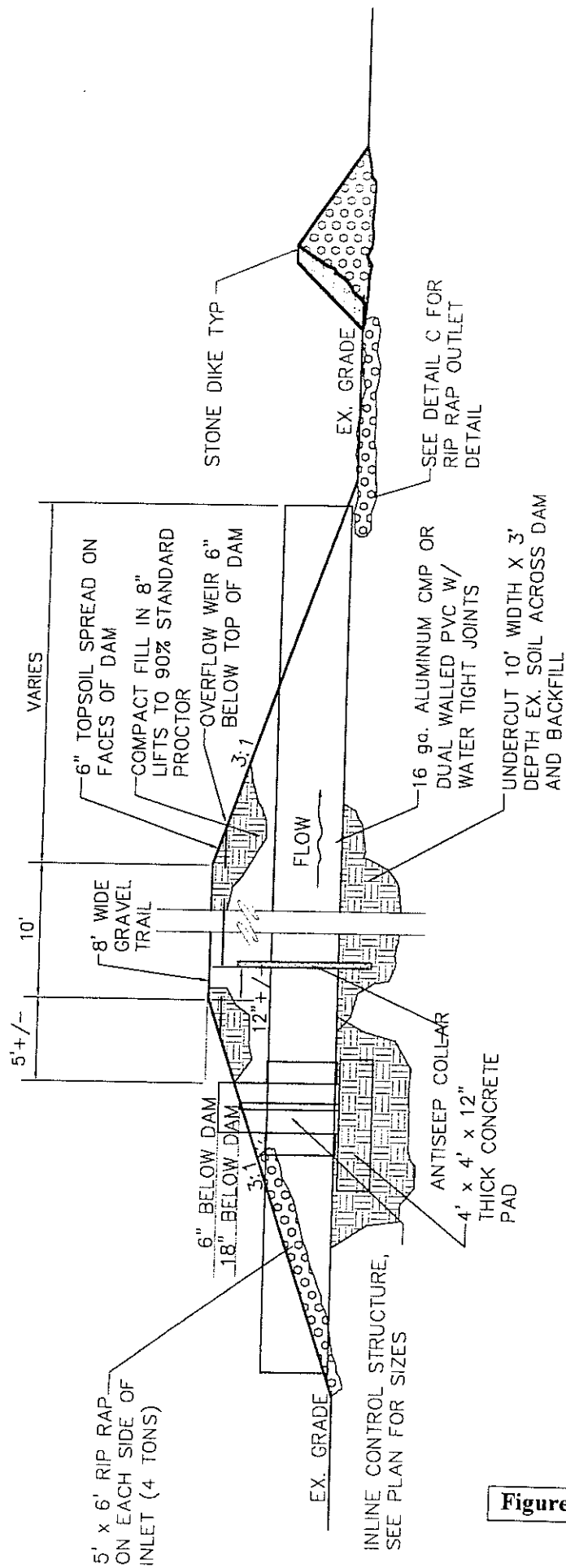
NTS



(F) **STONE DIKE**
not to scale

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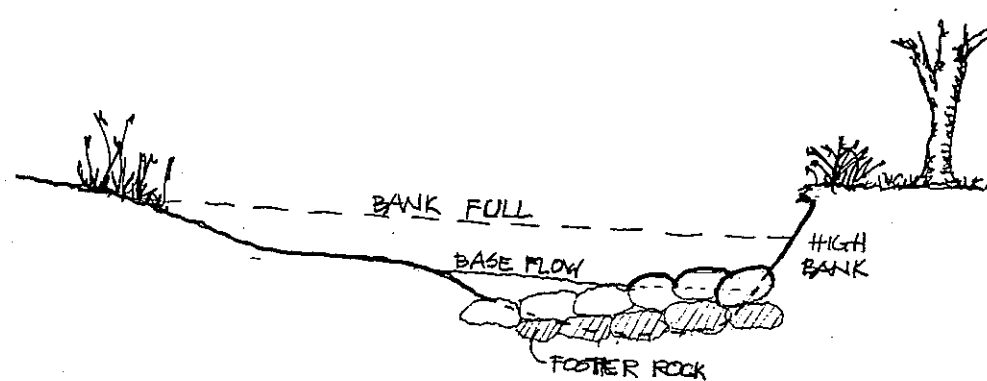
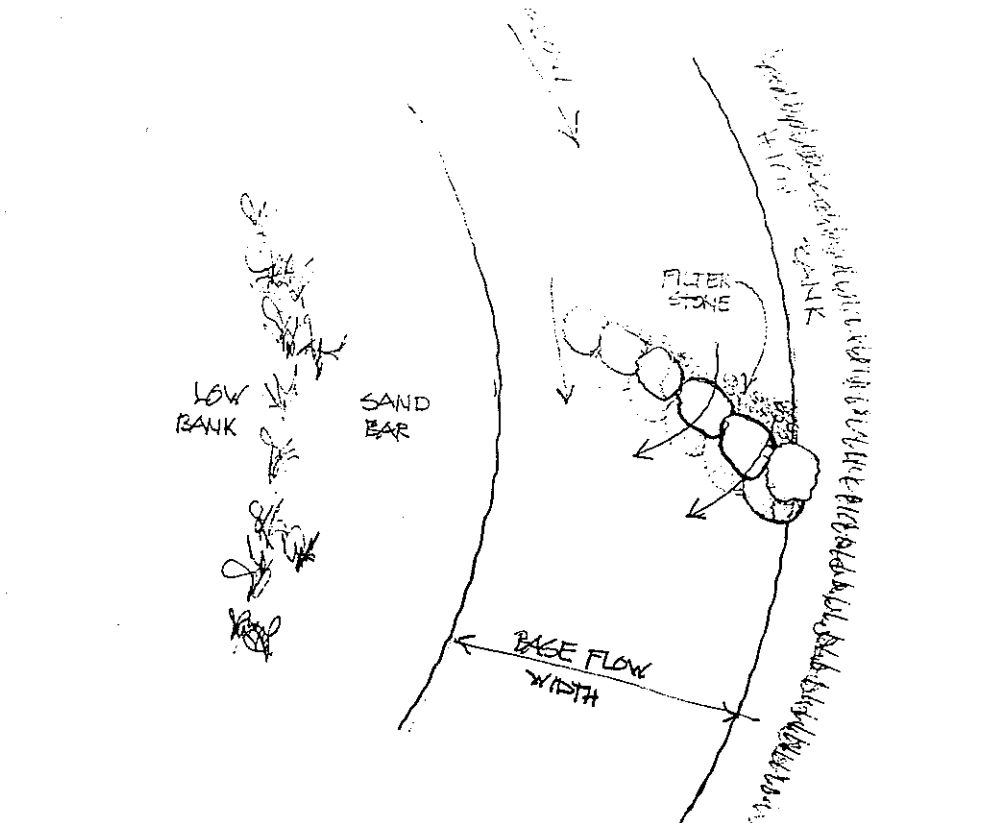
Figure 6, Sheet 8



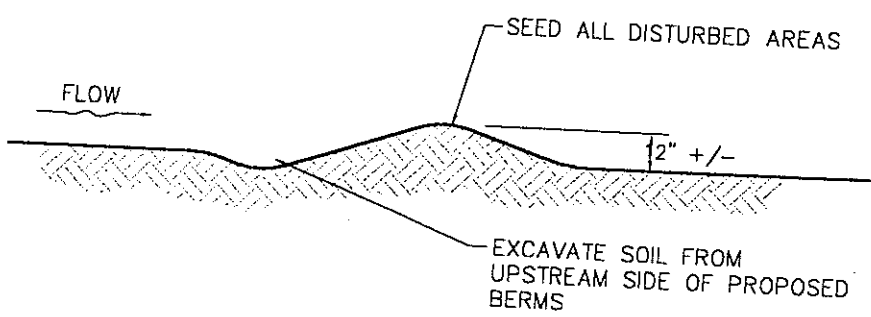
A INLINE CONTROL STRUCTURE & DAM
NOT TO SCALE

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Figure 6, Sheet 9



SINGLE WING DEFLECTOR
 NTS



LOW BERM
 NTS

Figure 6, Sheet 6